



Intellectual Property Versus Prizes: A Policy-Lever Analysis

Citation

Benjamin N. Roin, Intellectual Property versus Prizes: A Policy-Lever Analysis, 2010.

Permanent link

<http://nrs.harvard.edu/urn-3:HUL.InstRepos:10612848>

Terms of Use

This article was downloaded from Harvard University's DASH repository, and is made available under the terms and conditions applicable to Open Access Policy Articles, as set forth at <http://nrs.harvard.edu/urn-3:HUL.InstRepos:dash.current.terms-of-use#OAP>

Share Your Story

The Harvard community has made this article openly available.
Please share how this access benefits you. [Submit a story](#).

[Accessibility](#)

INTELLECTUAL PROPERTY VERSUS PRIZES: A POLICY-LEVER ANALYSIS

Benjamin N. Roin*
Dec. 15, 2010

I. Introduction

Most developed nations rely on intellectual property as one of their primary tools to promote private investments in R&D. An alternative approach is for the government to reward innovators with a prize instead of an intellectual property right, such that innovations fall immediately into the public domain. This idea dates back centuries, but over the past decade there has been an explosion of scholarship on the subject. Policymakers and even the press have started to talk about use prizes as an alternative to intellectual property – particularly for prescription drugs. In the scholarly literature, it is generally assumed that eliminating intellectual property rights would result in prices closer to marginal cost, thereby reducing deadweight loss. The standard objection to prize proposals is that the government might offer the wrong reward for innovation. Scholarship on the prize system largely focuses on design mechanisms to ensure that the government offers appropriate rewards to innovators.

This article examines the growing literature on the prize system and reaches several conclusion about the choice between intellectual property and prizes. First, the proponents of the prize system have made a respectable case that the government could acquire sufficient information about innovations to calculate an appropriate prize. Several scholars have taken this argument too far, however, concluding that prizes are superior to intellectual property in part because they offer better incentives for innovation. This argument is mistaken because any

* Hieken Assistant Professor of Patent Law, Harvard Law School. Thanks to Glenn Cohen, Einer Elhauge, Allison Hoffman, Louis Kaplow, Kevin Outterson, Steven Shavell, and the attendees at the Harvard Law and Economics Workshop (2009) and Harvard Health Law Policy Workshop (2009). All errors are my own.

mechanism to calculate rewards under a prize system could also be used to supplement or tax profits under intellectual property, resulting in the same outcome. The prize system therefore cannot be justified as a way to improve the incentives for innovation provided by intellectual property.

Second, government mismanagement of prize payouts may distort the incentives for R&D under a prize system. There is a significant danger that the government will try to underpay innovators; and the allocation of prize money will likely be affected by pork-barrel politics, industry rent-seeking and bureaucratic red tape.

Third, although prize advocates generally agree that the core justification for replacing intellectual property with prizes is to set consumer prices more efficiently, the existing scholarship glosses over the likely impact of prizes on consumer prices. A prize system would almost certainly move prices closer to marginal cost, but in some circumstances that movement would be only modest. Moreover, there may be other ways of setting consumer prices near marginal cost without eliminating intellectual property, such as government price controls.

Part II provides background on the choice between intellectual property and prizes. The intellectual property system is designed to promote innovation by giving firms that create new inventions or work of authorships a temporary, exclusive right over their products. This right allows them to sell their products at higher prices than would be possible in a competitive market. The firms can therefore appropriate a portion of the social value of their creations. The allure of these profits is how the intellectual property system spurs innovation. Once innovations have been created, however, the higher prices enabled by intellectual property reduce consumers' access to them. The prize system is an alternative mechanism for promoting innovation that avoids this inefficiency. Under a prize system, the government pays firms directly for their innovations instead of giving them an intellectual property right. If the government sets prize

values equal to expected profits under intellectual property, firms would have the same incentive to invest in R&D, but consumers would be spared from paying high prices. The problem with the prize system is that it relies on the government to set the reward for innovation, and the government might be poorly suited to that task.

Part III discusses the prize system's likely effect on the incentives for innovation. The prize literature is largely devoted to exploring possible mechanisms through which the government might calculate prize payouts. The case for switching to prizes is bolstered by the intellectual property system's own deficiencies in setting the reward for innovation, which make it possible to design a prize system that actually improves the incentives for innovation while reducing deadweight loss. Since the government could correct any flaws in the current reward for innovation without eliminating intellectual property (*e.g.*, through a tax or subsidy to innovators), those deficiencies are not an independent reason to prefer prizes to intellectual property. Nonetheless, the intellectual property system's imperfections provides the government with room for error if it were to set rewards under a prize system. It remains unclear whether the government could ever be trusted to implement such a system. The prize system gives the government total control over innovators' profits, since government officials must appraise new innovations and give out rewards. At the same time, the prize system is essentially a large public-expenditure program that will distribute money to innovators – mostly corporations. Government programs of this nature are vulnerable to a variety of distortions, including underpaying many innovators, using prize funding for fiscal pork, industry rent-seeking and bureaucratic costs and delays.

Part III examines whether a prize system would likely improve consumers' access to innovations that are now protected by intellectual property. It concludes that for many types of

innovations, including pharmaceuticals, the potential gains from switching to prizes may be modest, and that prizes are not the only way to push prices closer to marginal cost.

Section A of Part II discusses the inefficiencies in consumer pricing caused by intellectual property. Market forces sometimes help mitigate those inefficiencies through price discrimination, but only to a limited extent. There is clearly room for improvement.

Section B of Part II examines whether eliminating intellectual property in favor of prizes would lessen deadweight loss by moving consumer prices closer to the optimum. The ideal price for an innovation is the marginal costs of producing that additional unit of the good. By eliminating intellectual property, the prize system uses competition to drive prices toward marginal cost. Prizes would likely achieve this ideal result for goods that can be disseminated as digital files, since the marginal cost of producing each unit is effectively zero and, without intellectual property, they could be downloaded for free from the Internet. For most other goods, the potential efficiency gains from eliminating intellectual property are more limited. Oftentimes there are other barriers to competitive pricing besides intellectual property, including regulatory hurdles and trade secrecy and know-how in production. Even assuming perfect competition in the absence of intellectual property, consumer prices will still exceed marginal cost when there are fixed manufacturing costs and economies to scale. Finally, there is a danger that the prize system would lead to allocative inefficiency by causing innovators to price their goods *below* marginal cost to boost sales volume as a way to trick the government into increasing its reward. As a result, the advantages of prizes over intellectual property in setting consumer prices will vary according to the characteristics of the market for each innovation and the design of the prize system.

Section C of Part II argues that there are ways other than prizes to push prices closer to marginal cost: the government can impose price controls to approximate marginal-cost pricing or

use consumer subsidies. Since these approaches rely on the government to set prices at marginal cost, their benefits depend on the information available to the government about the production costs of different innovations – which will often be limited. Government price controls are safer when marginal cost is easily observable, such as with music and software because marginal cost is clearly zero. Also, when there are significant barriers to entry besides intellectual property, government price controls might be the only way of lowering prices meaningfully toward marginal cost.

II. BACKGROUND

A. THE JUSTIFICATION FOR GOVERNMENT INTERVENTION TO SUPPORT R&D

Innovation is crucial for social welfare, but in a competitive market, private investment in R&D tends to be inadequate. The problem is that R&D creates an informational good, and when information can be copied at little cost, competitors can “free ride” off of the innovator’s efforts, preventing it from recouping its R&D investment. Without some way to recover their R&D costs, private industry will not adequately invest in innovation.

Innovation, defined broadly as the development of new ideas and expressions, has led to tremendous gains in social welfare.¹ The public now enjoys a constant stream of new expressions in the form of art, literature, music and film, all of which can possess significant entertainment

¹ See Bronwyn H. Hall et al., *Measuring the Returns to R&D*, in 2 HANDBOOKS IN ECONOMICS: ECONOMICS OF INNOVATION 1065-1073 (Bronwyn H. Hall & Nathan Rosenberg eds., 2010) (surveying the economic literature on the social returns to R&D, and concluding that the literature suggests that the social return from R&D is higher than the private return, but acknowledging certain measurement problems); Peter S. Menell & Suzanne Scotchmer, *Intellectual Property*, in 2 HANDBOOK OF LAW & ECONOMICS 1476 (2008) (“It is now widely recognized that technological advancement and enhanced human capital are the principal engines of economic growth in the United States and other industrialized countries.”).

value or provide cultural enrichment.² Innovation in the form of new ideas, and particularly new technologies, has been even more profound.³ Not only does technological innovation allow us to live significantly longer and more comfortable lives⁴; it also underpins long-run economic growth, and thus is responsible for much of the wealth of modern industrialized societies.⁵

Economists attribute the link between innovation and economic growth to the nonrivalrous nature of ideas.⁶ Unlike human capital and other economic goods, ideas are knowledge – an intangible asset that everyone can share. Ideas are therefore public goods in the

² See JAMES HEILBRUN & CHARLES M. GRAY, *THE ECONOMICS OF ART AND CULTURE* _ (2d 2001).

³ See generally Joel Mokyr, *Long-Term Economic Growth and the History of Technology*, 1B HANDBOOK OF ECONOMIC GROWTH 1114 (Philippe Aghion & Steven N. Durlauf eds. 2005) (linking the Industrial Revolution and subsequent technological innovation with the unprecedented economic growth of modern industrialized societies); Paul M. Romer, *Two Strategies for Economic Development: Using Ideas and Producing Ideas*, in PROCEEDINGS OF THE WORLD BANK ANNUAL CONFERENCE ON DEVELOPMENT ECONOMIC 63 (1992) (arguing for the importance of innovation and dissemination of “ideas” – rather than just technology – for economic growth). The literature coming out of business schools suggests that the development of new management structures, operational strategies and market space can be just as important as technological innovation. See. Leonard L. Berry et al., *Creating New Markets Through Service Innovation*, 47 MIT SLOAN MANAGEMENT REV. 56 (2006) (analyzing “‘market-creating service innovation,’ ... define[d] as an idea for a performance enhancement that customers perceive as offering a new benefit of sufficient appeal that it dramatically influences their behavior, as well as the behavior of competing companies”); Gary Hamel, *The Why, What, and How of Management Innovation*, 84 HARV. BUS. REV. 72 (2006) (arguing that “management innovation, more than any other kind of innovation, has allowed companies to cross new performance thresholds”); Michael Hammer, *Deep Change: How Operational Innovation Can Transform Your Company*, 82 HARV. BUS. REV. 84, 86 (2004) (arguing that operational innovation – defined as “coming up with entirely new ways of filling orders, developing products, providing customer service, or doing any other activity that an enterprise performs” – was “central to some of the greatest success stories in recent business history, including Wal-Mart, Toyota, and Dell”).

⁴ See Richard A. Easterlin, *The Worldwide Standard of Living Since 1800*, 14 J. ECON. PERSPECTIVES 7, 12 (2000) (“The qualitative change from that world [of the late 18th century] to the current panoply of consumer goods in the United States—cars and planes, electrical appliances and running water, telecommunications and computers, pharmaceuticals and health care, and the phenomenal array of food and clothes—is literally incredible.”).

⁵ See, e.g., Philippe Aghion & Peter Howitt, *Growth with Quality-Improving Innovations: An Integrated Framework*, 1A HANDBOOK OF ECONOMIC GROWTH 69 (Philippe Aghion & Steven N. Durlauf eds. 2005) (noting that “[t]echnological progress” is “the mainspring of long-run economic growth”); RICHARD R. NELSON, *THE SOURCES OF ECONOMIC GROWTH* 31 (1996) (“Virtually all scholars of productivity growth now agree on the central role of technological advance.”).

⁶ See Paul M. Romer, *Endogenous Technological Change*, 98 J. POL. ECON. S71, S73-S78 (1990).

technical sense of the term: their use by one person does not reduce their availability to others.⁷ Since ideas can be used over and over again without diminishment, they allow for increasing returns to scale on the world's finite stock of human and capital resources.⁸ By extracting more and more value out of society's labor and capital, innovation has generated much of the world's economic growth since the Industrial Revolution.⁹

The advancements in knowledge that produced these benefits did not come freely. Innovation is the product of human effort and requires the individuals' time and resources to accomplish. Proper incentives are therefore crucial. Given that a great deal of innovation comes from private industry, monetary incentives are particularly important.¹⁰

Society's reliance on innovation and technological growth presents a challenge because, in a competitive market, the incentive for private actors to invest in the R&D of new ideas and

⁷ Paul A. Samuelson, *The Pure Theory of Public Expenditure*, 36 REV. ECON. & STAT. 387, 387 (1954) (defining a public good as one where "each individual's consumption of such good leads to no subtraction from any other individual's consumption of that good"). More than a century earlier, Thomas Jefferson offered a more elegant formulation of why information and knowledge are different from tangible goods: "He who receives an idea from me, receives instruction himself without lessening mine; as he who lights his taper at mine, receives light without darkening me." Thomas Jefferson, Letter to Isaac McPherson (Aug. 13, 1813).

⁸ See generally Charles I. Jones, *Growth and Ideas*, in 1B HANDBOOK OF ECONOMIC GROWTH 1063 (Philippe Aghion & Steven N. Durlauf eds. 2005) (reviewing the economic literature about how the development of new ideas drives economic growth because ideas are nonrivalrous and therefore produce increasing returns to scale).

⁹ See Mokyr, *supra* note 3.

¹⁰ Innovation can also come from outside private industry, where non-monetary incentives sometimes substitute monetary ones. See Yochai Benkler, *Coase's Penguin, or Linux and the Nature of the Firm*, 112 YALE L.J. 369 (2002); Amy Kapczynski et al., *Addressing Global Health Inequities: An Open Licensing Approach for University Innovations*, 20 BERKELEY TECH. L.J. 1031, 1068-77 (2005). At universities, for example, most academic researchers appear to be primarily motivated by prestige, although they still require salaries and funding for their research.

expressions tends to be inadequate.¹¹ The problem stems from the intangibility of ideas and expressions, which can make it hard to prevent others from copying them. In addition to being nonrivalrous, therefore, ideas and expressions tend to be non-excludable. At the same time, the innovative process is often expensive and risky.¹² Writing a book or developing a drug usually requires a significant investment of time and resources, and the innovator always faces the risk that the project will end as a technological or commercial failure. If competitors can sell inexpensive duplicates of successful books or drugs without incurring the same costs and risks, price competition may prevent innovators from ever earning a return on their R&D investment. In a perfectly competitive market, therefore, private actors will be unwilling to invest in the production of new ideas and expressions that others can freely copy.¹³

Natural market conditions will support some amount of private investment in R&D,¹⁴ but probably not enough of it. Without government intervention, therefore, society's investments in

¹¹ See Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, in THE RATE AND DIRECTION OF INVENTIVE ACTIVITY _ (Richard Nelson ed. 1959); Richard R. Nelson, *The Simple Economics of Basic Scientific Research*, 67 J. POL. ECON. 297 (1959).

¹² See F.M. SCHERER, NEW PERSPECTIVES ON ECONOMIC GROWTH AND TECHNOLOGICAL INNOVATION 53-88 (1999).

¹³ See ARROW, *supra* note ; STEVEN SHAVELL, FOUNDATIONS OF ECONOMIC ANALYSIS OF LAW 138-140 (2004). This does not imply that markets free from government intervention cannot support investments in the production of knowledge or information – only that those investments will tend to be inadequate. See, e.g., F.M. SCHERER, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE 384 (1973).

¹⁴ Some innovations – like Coca-Cola's secret formula – can be commercially exploited without being revealed to competitors, which avoids the “free-riding” problem that can deter R&D. See *Coca-Cola Bottling Company of Shreveport, Inc. vs Coca-Cola Co.*, 696 F. Supp. 97, 106-109 (D. Del. 1988) (discussing “the renowned secrecy of Merchandise 7X, ‘the ingredient that gives Coca-Cola its distinctive taste,’ ... and ... the ‘impregnable barriers which the Company ... erected to protect its valuable trade secret ...”). Long-term secrecy, however, is infeasible for many types of ideas. See David J. Teece, *Profits from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy*, 15 RES. POL'Y 285, 287 (1986) (“Usually only chemical formulas and industrial-commercial processes (e.g., cosmetics and recipes) can be protected as trade secrets after they're ‘out’.”). Temporary secrecy – perhaps just during R&D before commercialization – can still give the innovator an important lead-time advantage in the market. Wesley M. Cohen et al., *Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms*

R&D will tend to be inadequate – and perhaps significantly so.¹⁵ Economists often disagree about the best policies for encouraging socially valuable R&D,¹⁶ but they all seem to accept the need for some form of government intervention.¹⁷

B. THE TRADITIONAL POLICY OPTIONS: INTELLECTUAL PROPERTY AND GOVERNMENT FUNDING FOR R&D

The government has a variety of different tools to promote R&D; intellectual property rights and government-funded R&D are two of the most important.¹⁸ Along the continuum of relevant policy levers, these two also lie at near opposite poles. When the government finances R&D directly, it has to raise the necessary funds, select which R&D projects to finance, choose the researchers who will carry them out, and monitor their performance. When the government uses intellectual property to promote innovation, individual consumers and firms make most of these decisions through a highly decentralized process. As a result, the intellectual property system is able to harness the information held by firms and consumers to direct R&D spending, and it avoids some of the political economy problems associated with public expenditures. On

Patent (or Not) – tbl., NBER Working Paper 7552 (2000). Moreover, after disclosing the basic idea for their innovation to the public, firms usually maintain an advantage in the “know-how” required to implement it. See Karl F. Jorda, *Intellectual Property Valuation: The Legal Counterpart/Counterpoint*, Law Seminars International Conference on Mining Patent Portfolios, at 4, Sept. 13, 2004. To the extent that firms can protect this knowledge base, they can slow down their competitors and enjoy some degree of market power.

¹⁵ See Jones, *supra* note , at 1087.

¹⁶ See Menell & Scotchmer, *supra* note , at 1477-78.

¹⁷ Even staunch opponents of government support for private sector R&D acknowledge that, at least in some cases, the government intervention is desirable. See, e.g., MICHELE BOLDRIN & DAVID K. LEVINE, *AGAINST INTELLECTUAL MONOPOLY* 277, 292-93 (2008) (advocating the abolition of intellectual property, but acknowledging that at least in the pharmaceutical industry, the government would need to increase public financing of clinical drug development).

¹⁸ See SCOTCHMER, *supra* note , at 30[fix].

the other hand, the intellectual property system finances R&D through what amounts to an excise tax on innovations, which, for the provision of a public good, is less efficient than funding through general tax revenue.

The intellectual property system is designed to encourage R&D investments in the private sector by allowing firms to appropriate some of the social surplus created by their innovations. Firms that create and disclose a new, useful and nonobvious invention receive a patent for their efforts, which gives them the right to exclude others from making, using or selling that invention.¹⁹ The authors of literary, musical, choreographic, dramatic and artistic works get copyrights on their works, providing them with the exclusive right to reproduce, adapt, distribute, and publicly display their works.²⁰ These rights turn innovators into monopolists over their inventions or works of authorship. Unless consumers have access to perfect substitutes of those creations, innovators can use their intellectual property rights to set prices above marginal cost. The revenue generated by these higher prices is the inducement for innovation under an intellectual property system, hopefully leading to the creation of new inventions and works of authorship that the public would otherwise not receive.²¹

The problem with intellectual property is that it reduces the public's access to new innovations by raising prices. Patents and copyrights allow innovators to set prices above marginal cost. These higher prices cause some consumers to exit the market even though they

¹⁹ See 35 U.S.C. § 154(a)(1).

²⁰ ROBERT A. GORMAN & JANE C. GINSBURG, COPYRIGHT: CASES AND MATERIALS 38 (6th ed. 2002).

²¹ See WILLIAM D. NORDHAUS, INVENTION, GROWTH, AND WELFARE: A THEORETICAL TREATMENT OF TECHNOLOGICAL CHANGE 88 (1969) (describing patents as “a way of internalizing the external economics of knowledge”); see also WILLIAM M. LANDES & RICHARD A. POSNER, THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW 375-377 (2003); SHAVELL, *supra* note , at .

value the innovation above its marginal cost of production.²² The result is deadweight loss. Since the higher prices caused by intellectual property are the mechanism through which the system promotes innovation, deadweight loss is often said to be an inevitable consequence of intellectual property rights.²³ An additional drawback to intellectual property is that it can encourage wasteful R&D due to patent races²⁴ and duplicative innovation.²⁵

The government can promote innovation without these problems by financing R&D directly. Instead of waiting for private industry to complete an R&D project and then rewarding the innovator with an intellectual property right, the government can just hire its own researchers, or contract a private firm to do the work. This approach avoids the deadweight loss

²² See VARIAN, *supra* note , at .

²³ See, e.g., Joseph E. Stiglitz, *Economic Foundations of Intellectual Property Rights*, 57 DUKE L.J. 1693, 1700 (2008) (“[E]fficiency in use means knowledge should be freely available. The problem is that intellectual property rights circumscribe the use of knowledge and thus, almost necessarily, cause inefficiency. ... [I]t is part of our legal framework because we hope it will promote innovation.”); NORDHAUS, *supra* note , at 86 (“The optimal system of production of knowledge has a price for information of zero, whereas the patent system ensures a nonzero price for the life of the patent.”).

²⁴ Patent races arise when rival firms compete for the exclusive rights to an innovation and only one of them can get it. A contest of this nature can invite strategic behavior by the competitors. Firms may find it profitable to increase their R&D spending in ways that improve their chances of beating the other firms to the patent office – e.g., by spending to accelerate their R&D. The private value of this investment will sometimes exceed its social value because of its “business-stealing effect.” Under certain circumstances, the opportunities to gain at another firm’s expense may lead to excessive R&D spending. See Menell & Scotchmer, *supra* note , at 1488-90. In extreme circumstances, the competition to earn a patent can produce a race that dissipates all expected profits. See *id.*; Glenn C. Loury, *Market Structure and Innovation*, 93 Q.J. ECON. 395 (1979); Partha Dasgupta & Joseph Stiglitz, *Industrial Structure and the Nature of Innovative Activity*, 90 ECON. J. 266 (1980); Partha Dasgupta & Joseph Stiglitz, *Uncertainty, Industrial Structure, and the Speed of R&D*, 11 BELL J. ECON. 1 (1980); Brian D. Wright, *The Economics of Invention Incentives: Patents, Prizes, and Research Contracts*, 73 AM. ECON. REV. 691 (1983).

²⁵ Duplicative innovation can occur when rival firms are competing to produce highly similar innovations, but the outcome of each firm’s R&D will be sufficiently distinctive to receive its own patent. Unlike a patent race, therefore, this contest allows for more than one winner. Yet the result is fairly similar: to the extent that rival firms engage in R&D that produces substitute innovations, R&D spending may be excessive. See Rebecca Henderson & Iain Cockburn, *Racing or Spilling? The Determinants of Research Productivity in Ethical Drug Discovery* (1993); F.M. Scherer, *Markets and Uncertainty in Pharmaceutical Development*, KSG Working Paper RWP07-039, at 19-21 (2007).

from monopoly pricing under intellectual property, and it allows the government to coordinate R&D activities to avert patent races and duplicative innovation.²⁶

There is a long history of government support for the arts and sciences,²⁷ and that support continues to this day. According to the National Science Foundation, the United States government spent over \$100 billion on R&D in 2008.²⁸ That investment constituted roughly one half of the total domestic spending on research, and about 17% of domestic spending on development.²⁹ The government's direct financial support for the arts and culture is more modest, but still significant – estimated to be about \$3 billion in 2000.³⁰

²⁶ See Stiglitz, *supra* note , at 1722-24; Wright, *supra* note , at 692-95.

²⁷ See MEDIEVAL SCIENCE, TECHNOLOGY, AND MEDICINE: AN ENCYCLOPEDIA 385-387 (THOMAS GLICK ET AL. eds., 2005) (attributing numerous technological advances to medieval patronage, including the calendar, catapults, artillery, fire arms, watermills and windmills).

²⁸ See Mark Boroush, *New NSF Estimates Indicate that U.S. R&D Spending Continued to Grow in 2008*, INFOBRIEF, National Science Foundation, Jan. 2010, at <http://www.nsf.gov/statistics/infbrief/nsf10312/nsf10312.pdf>. According to the Congressional Budget Office, the United States government allocated \$137 billion for R&D in 2007. See CONGRESS OF THE UNITED STATES: CONGRESSIONAL BUDGET OFFICE, FEDERAL SUPPORT FOR RESEARCH AND DEVELOPMENT 3 (2007). Funding allocations by agency in 2004 were as follows: 45% to the Department of Defense; 28% to the National Institutes of Health; 8% to the Department of Energy; 7% to the National Aeronautics and Space Administration; 4% to the National Science Foundation; 2% to the Department of Agriculture; and 6% to other agencies. *Id.* at xi fig. 4.

²⁹ See CONGRESSIONAL BUDGET OFFICE, *supra* note __, at vii. The precise divide between research and development is difficult to define, but the term “research” generally refers to projects that expand scientific knowledge, whereas “development” describes the application more generalized scientific knowledge to the creation of a particular marketable product. *Id.* at 10.

³⁰ See Dick Netzer, *Cultural Policy: An American View*, in 1 HANDBOOK OF THE ECONOMICS OF ART AND CULTURE 1235-1238 (Victor A. Ginsburgh & David Throsby eds. 2006). Most European governments provide significantly more direct financial support for arts and culture – measured as a percentage of their GDP – than does the United States. See Frederick Van Der Ploeg, *The Making of Cultural Policy: A European Perspective*, in 1 HANDBOOK OF THE ECONOMICS OF ART AND CULTURE 1190-1193 (Victor A. Ginsburgh & David Throsby eds. 2006). In the United States, however, the government encourages billions of dollars in additional private donations for the arts and culture each year through the tax code. See Netzer, *supra*, at 1240.

There are costs associated with raising money to finance government-funded R&D, but compared to an intellectual property system that finances innovation through higher consumer prices, those costs are probably modest. When evaluating the case for government funding of a public good, economists traditionally consider the efficiency costs of financing the program – *i.e.*, the deadweight loss from labor distortion caused by an income tax.³¹ Although those costs can be significant,³² the conventional wisdom is that the deadweight loss from monopoly pricing on particular goods and services is likely much worse.³³ Some economists even argue that, because of redistributive effects and the potential for an offsetting tax adjustment, any labor-distortion costs from financing public goods through an income tax should be ignored.³⁴ Under this view, financing innovation with general tax revenue is almost certainly preferable to monopoly pricing.

While the benefits of funding R&D through the tax system can be significant, there are drawbacks to relying on the government to manage the nation's R&D investments.³⁵ Several problems confront government agencies as they allocate limited R&D funds. First, the

³¹ See Alan J. Auerbach, *The Theory of Excess Burden and Optimal Taxation*, in I HANDBOOK OF PUBLIC ECONOMICS 110-112 (A.J. Auerbach & M. Feldstein, eds. 1985).

³² See, *e.g.*, Martin Feldstein, *Tax Avoidance and the Deadweight Loss of the Income Tax*, 81 REV. ECON. & STUD. 674, 677-679 (1999).

³³ See Gallini & Scotchmer, *supra* note , at 54; Guell & Fischbaum, *supra* note , at 356 & n.1; Romer, *supra* note , at 215; Stiglitz, *supra* note , at 1713-1714; Wright, *supra* note , at 691. *But see* Duffy, *supra* note , at 46 (“A reward system cannot be compared to IP rights without comparing the distortionary effects of patents and taxes. ... Given that the IP right holder also has the potential constraint of competition from other technology, it is by no means clear that the IP right holder will cause greater distortions than the government's revenue agents.”).

³⁴ See KAPLOW, *supra* note , at (arguing that labor distortion incidental to the financing and provision of public goods normally should not weigh against the efficiency gains from such a program because that distortion could be avoided with an offsetting adjustment to the income tax, and because the costs of the distortion need to be measured against the corresponding redistributive benefits).

³⁵ See Nancy Gallini & Suzanne Scotchmer, *Intellectual Property: When Is It the Best Incentive System?*, in 2 INNOVATION POLICY AND THE ECONOMY 51 (Adam Jaffe et al. eds. 2002); Brian D. Wright, *The Economics of Invention Incentives: Patents, Prizes, and Research Contracts*, 73 AM. ECON. REV. 691 (1983).

government is sometimes poorly positioned to identify R&D projects worthy of public financing – particularly when good ideas are widely distributed across firms.³⁶ The government also may have less information than firms about the value of R&D projects³⁷ or be less competent at performing those evaluations.³⁸ Second, the government may select the wrong firm or research team to conduct the R&D.³⁹ Third, if the government cannot adequately monitor the performance of R&D, its agents will be prone to “shirking” and waste.⁴⁰ Fourth, political forces

³⁶ See SCOTCHMER, *supra* note , at 38 (“Probably the most important obstacle to effective public sponsorship is in tapping ideas for invention that are widely distributed among firms and inventors.”); cf. CONGRESSIONAL BUDGET OFFICE, *FEDERAL SUPPORT FOR RESEARCH AND DEVELOPMENT* 13-14 (2007) (“[S]ome observers argue that relying on peer review may favor conservative projects (providing only incremental progress in expanding existing knowledge) over pioneering or interdisciplinary work.”).

³⁷ See Michael Kremer, *Patent Buyouts: A Mechanism for Encouraging Innovation*, 113 Q.J. ECON. 1137, 1143-44 (1998).

³⁸ As Stiglitz and Wallsten explain:

[T]he only way to implement an incentive mechanism [for the government to fund the right projects] ... is to include a comprehensive evaluation mechanism as part of the program. That is, properly rewarding and punishing program managers is possible only if there is some way to detect what type of projects they fund. Evaluating technological is technically very difficult. A comprehensive evaluation would combine complicated scientific knowledge with economic analysis under conditions of uncertainty. In any event, as Adam Jaffe (1998) notes, technology programs have never been designed with economic evaluation in mind. Without some comprehensive evaluations, public debates on these programs tend to focus on easily measurable private returns and easily understandable anecdotal stories of project success and failure.

See Joseph E. Stiglitz & Scott J. Wallsten, *Public-Private Technology Partnerships: Promises and Pitfalls*, 43 AM. BEHAV. SCI. 52, 61 (1999).

³⁹ See Stiglitz, *supra* note , at 1722 (noting that one of the biggest problems with “government-funded research” is that “there is a group of peers (or bureaucrats)[] deciding who is the best researcher”).

⁴⁰ See Keith Hartley, *The Arms Industry, Procurement and Industrial Policies*, in 2 HANDBOOK OF DEFENSE ECONOMICS 1162 (Todd Sandler & Keith Hartley eds. 2007) (“Generally, ... moral hazard allows the firms to take discretionary action affecting its costs or the quality of its products (e.g., effort levels might not be maximized reflected in labor hoarding and ‘on-the-job’ leisure.”); Kremer, *supra* note , at 1143; Frank R. Lichtenberg, *The Private R&D Investment Response to Federal Design and Technical Competitions*, 78 AM. ECON. REV. 550, 552 (1988); William P. Rogerson, *Economic Incentives and the Defense Procurement Process*, 8 J. ECON. PERSPECTIVES 65, 70 (1994) (noting that when the Department of Defense contracts for R&D work, it can “find it difficult to observe and measure ... the level of management commitment to a project, whether the best engineers are working on the project, or whether a company has a relevant ongoing research effort.”).

can distort the government's selection of R&D projects. After reviewing several case studies of federally funded R&D commercialization projects, Linda Cohen and Roger Noll conclude that:

[the] overriding lesson from the case studies is that the goal of economic efficiency—to cure market failures in privately sponsored commercial innovation—is so severely constrained by political forces that an effective, coherent national commercial R&D program has never been put in place.⁴¹

In short, the value of government-funded R&D is limited by the government's competence in managing those investments.⁴²

Comparing the various virtues and vices of intellectual property and government-funded R&D, most scholars agree that both systems serve an important role.⁴³ In fields like defense and aerospace, where the government often has the foresight to identify promising R&D objectives and the expertise to evaluate project proposals, government-funded R&D can be a crucial tool for promoting innovation. In fields like film production and consumer electronics, on the other hand, the government seems poorly suited to make investment decisions, and the public relies on intellectual property. And in fields like medicine, a mixed approach has proven to be incredibly productive.⁴⁴

⁴¹ Linda R. Cohen & Roger G. Noll, *An Assessment of R&D Commercialization Programs*, in *THE TECHNOLOGY PORK BARREL* 378 (Linda R. Cohen & Roger G. Noll eds., 1991).

⁴² *Cf.* CONGRESSIONAL BUDGET OFFICE, *FEDERAL SUPPORT FOR RESEARCH AND DEVELOPMENT* 13-14 (2007) (“[S]low-growing funding for some scientific fields, the constraints some agencies place on the length of time research may take, and the high risk of failure are all factors in the federal government’s funding of fewer highly uncertain but potentially groundbreaking research projects.”); Kremer, *supra* note , at 1143 (citing various studies which found that the social return from private R&D is significantly higher on average than the return from public R&D investments).

⁴³ *See, e.g.*, Stiglitz, *supra* note , at 1721-24; *cf.* Gallini & Scotchmer, *supra* note , at 70 (“IP is probably the best mechanism for screening projects when value and cost are not observable by the sponsor, since the private value of IP reflects the social value, and firms automatically compare some measure of value with the cost of innovation.”).

⁴⁴ *See* Wesley M. Cohen *et al.*, *Links and Impacts: The Influence of Public Research on Industrial R&D*, 48 *MANAGEMENT SCI.* 1 (2002); Iain M. Cockburn & Rebecca M. Henderson, *Publicly Funded Science and the*

C. THE PRIZE SYSTEM AS AN ALTERNATIVE TO INTELLECTUAL PROPERTY

a. The basic comparison between intellectual property and prizes.—Although most commentators recognize certain virtues of using intellectual property to encourage private sector R&D,⁴⁵ many remain uncomfortable with the deadweight loss associated with the monopoly pricing it allows. Rather than accepting this deadweight loss as a necessary evil of promoting innovation, a growing number of scholars have suggested moving to a prize system. By rewarding innovators with prizes instead of intellectual property rights, the government could avoid the deadweight caused by patents and copyrights without needing to take direct control over private industry's R&D investments. The danger of this approach is that government might jeopardize the incentives for innovation if it calculates prize payouts incorrectly. In comparing prizes to intellectual property, therefore, scholars weigh the welfare gains from reducing deadweight loss caused by monopoly pricing against the risk of distorting the incentives for innovation.

The basic idea behind a prize system is that would operate much like an intellectual property regime except that the government compensates innovators with prizes instead of intellectual property rights.⁴⁶ When firms successfully complete an R&D project, their

Productivity of the Pharmaceutical Industry, in 1 INNOVATION POLICY AND THE ECONOMY (Adam B. Jaffe et al. eds. 2001).

⁴⁵ *But see* MICHELE BOLDRIN & DAVID K. LEVINE, AGAINST INTELLECTUAL MONOPOLY (2008) (arguing for the gradual abolition of intellectual property rights).

⁴⁶ A different approach from the one discussed here is for the government to set the prize value ex ante, essentially offering a bounty to any innovator who solves a specified problem in a way that satisfied certain posted criteria. *See* Davis & Davis, *supra* note , at 230-247 (analyzing several examples of ex ante prizes); Thomas Kalil, *Prizes for Technological Innovation*, The Brookings Institution, Discussion Paper 2006-08 (2006), at www.hamiltonproject.org; COMMITTEE ON THE DESIGN OF AN NSF INNOVATION PRIZE, NATIONAL RESEARCH COUNCIL, INNOVATION INDUCEMENT PRIZES AT THE NATIONAL SCIENCE FOUNDATION (2007). Assuming that the commitment to pay is credible, these ex ante prizes would avoid the potential *in terrorem* effect of setting prizes when the innovator's costs are already sunk. Ex ante prizes only work in limited circumstances, however. The government must know ahead of time the innovations

innovations pass immediately into the public domain.⁴⁷ Items like software and music could be downloaded for free;⁴⁸ drugs would be available as generics shortly after they enter the market;⁴⁹ and manufacturers could utilize new technologies or processes without paying a licensing fee to the innovators.⁵⁰ To ensure that firms still invest in R&D, the government offers prizes as the inducement for innovation, paying firms directly in return for their contribution to society's store of knowledge.

The appeal of a prize system is obvious. Since it eliminates intellectual property rights, the prize system avoids any deadweight loss from higher consumer prices associated with monopoly pricing under intellectual property.⁵¹ The public would be able to freely copy the

that will be socially valuable, and it must be able to specify precise performance standards necessary for an innovation to qualify for the prize. See Thomas Pogge, *The Health Impact Fund: Better Pharmaceutical Innovations at Much Lower Prices*, in INCENTIVES FOR GLOBAL HEALTH: PATENT LAW AND ACCESS TO ESSENTIAL MEDICINES 178, 194-195 (Thomas Pogge et al., eds. 2010); Stiglitz, *supra* note , at 1724. Discussions about replacing the intellectual property system with prizes therefore focus on mechanisms that would allow the government to determine prize payouts ex post. See, e.g., Penin, *supra* note , at 641.

⁴⁷ See, e.g., SHAVELL, *supra* note , at 161 (“A system that provides a fundamental alternative to property rights in information is one in which the state pays rewards to creators of information and then places the information in the public domain, making it freely available to all—so that no property rights in the information exist.”); Julien Penin, *Patents Versus Ex Post Rewards: A New Look*, 34 RESEARCH POLICY 641, 642 (2005) (“Under a system of ex post reward, innovators are paid directly by governments for their contributions to social welfare and their innovations pass immediately into the public domain.”).

⁴⁸ See WILLIAM W. FISHER III, PROMISES TO KEEP: TECHNOLOGY, LAW, AND THE FUTURE OF ENTERTAINMENT 199-258 (2004) (proposing a prize system for music and film that would replace the existing system of copyright protection and encryption measures); Paul Romer, *When Should We Use Intellectual Property Rights?*, 92 AM. ECON. REV. 213, 214-217 (2002) (discussing the monopoly distortions in the music industry caused by copyright protection, and the potential of using prizes to promote innovation without those distortions).

⁴⁹ See, e.g., Joseph Stiglitz, *Give Prizes Not Patents*, NEW SCIENTIST, Sept. 16, 2006, at 21.

⁵⁰ Cf. Penin, *supra* note , at 651-653 (discussing the implications of a prize system in industries where intellectual property rights are less important for appropriating the returns from innovation than for technology trading and cross-licensing).

⁵¹ See, e.g., Gallini & Scotchmer, *supra* note , at 62 (“IP and prizes can serve the same screening function, and can motivate firms to the same levels of effort, but prizes avoid the deadweight loss.”); Penin, *supra* note , at 645 (“[E]x post rewards increase the competition for the production and distribution of a given

ideas and expressions that are now protected with exclusive rights. Competition would then reduce prices, allowing for the more efficient dissemination and utilization of innovations.⁵² The government still needs to finance the prize system with tax revenue, but just like the financing for government-funded R&D, this revenue source causes less distortion than the monopoly pricing associated with intellectual property.⁵³

The prize system also avoids many of the drawbacks of relying on the government to manage the nation's R&D investments. Under a prize regime, the government does not need to know which R&D projects will be successful, which firms are best able to carry them out, or how to monitor firms as they conduct their R&D.⁵⁴ It just needs to reward the firms that successfully produce an innovation. Although this approach prevents the government from stopping “patent races” and duplicative innovation by coordinating R&D investments, intellectual property has the same drawback.⁵⁵

The literature on prizes also recognizes a downside to the system: it relies on the government to set the reward for innovation, not consumers. Under an intellectual property

innovation and they lead to price decrease as compared with the patent system.”); SHAVELL, *supra* note , at 162 (describing the prize system as one where, “[i]n general, due to competition, goods embodying new information would tend to sell at prices resembling production cost, meaning that the quantity sold tend toward the optimal”).

⁵² See Barry, *supra* note , at 620; Chari et al., *supra* note , at 1 (“Prizes reward innovators while making the fruits of the innovation public. Competitive markets then produce an efficient number of units of the good or exploit the idea associated with the innovation as efficiently as possibl[e].”); Kremer, *supra* note , at 1148 (“Deadweight losses due to monopoly pricing would be eliminated if patents were put in the public domain.”); Stiglitz, *supra* note , at 1720 (describing prizes as a way “to use the competitive market to ensure efficient dissemination” of knowledge)

⁵³ See *supra* text accompanying notes 31-34.

⁵⁴ See Richard G. Newell & Nathan E. Wilson, *Technology Prizes for Climate Change Mitigation* 8-11 (2005); SCOTCHMER, *supra* note , at .

⁵⁵ See SHAVELL, *supra* note , at 163; Stiglitz, *supra* note , at 1722-1723; Deborah D. Stine, *Federally Funded Innovation Inducement Prizes* 2 (2009) Wright, *supra* note , at 699-700.

system, the incentive to invest in innovation is the profits from selling innovations as their exclusive supplier. Assuming that consumers do not pay more for innovations than their value to them, intellectual property rights tie the rewards for innovation to their social value⁵⁶ – albeit imperfectly.⁵⁷ Prizes use the government to determine the reward, and many scholars are skeptical of the government’s ability to estimate the social value of innovations⁵⁸ or of its trustworthiness for paying a reasonable reward.⁵⁹

Following these concerns, the literature offers a simple framework for evaluating the choice between prizes and intellectual property: a prize system is desirable if the resulting gains from efficient access to innovation exceed the harm – if any – from relying on the government to set the reward for innovation.⁶⁰ Economists widely agree that if the government could reliably

⁵⁶ See SCOTCHMER, *supra* note , at .

⁵⁷ See *infra* text accompanying notes __-__.

⁵⁸ See, e.g., JOHN STUART MILL, PRINCIPLES OF POLITICAL ECONOMY: WITH SOME OF THEIR APPLICATIONS TO SOCIAL PHILOSOPHY 933 (W.J. Ashley ed., 1909) (“[I]n general an exclusive privilege, one of temporary duration, is preferable [to prizes]; because it leaves nothing to any one’s discretion; because the reward conferred by it depends entirely upon the invention’s being found useful, and the greater the usefulness the greater the reward; and because it is paid by the very persons to whom the service is rendered, the consumers of the commodity.”); SCHERER, *supra* note , at 398 (“[E]stimating the value of inventive contributions is a difficult task, and any bureaucratic council entrusted with the job is bound to make mistakes and perpetrate inequities.”); GEORGE STIGLER, THE ORGANIZATION OF INDUSTRY 124 (1983) (“The difficulties of devising even remotely objective estimates of the social value of pieces of knowledge are prodigious, however.”); JEAN TIROLE, THE THEORY OF INDUSTRIAL ORGANIZATION 400-401 (1988).

⁵⁹ See DiMasi & Grabowski, *supra* note , at 489; Fritz Machlup & Edith Penrose, *The Patent Controversy in the Nineteenth Century*, 10 J. ECON. HIST. 1, 20 (1950) (explaining that during the patent-abolition debates in the mid- and late-1800s, “[t]he chief objection” to prize proposals “was that their administration would give rise to partiality, arbitrariness, or even corruption—the dangers of all institutions giving discretionary power to administrators.”); SCHERER, *supra* note , at 398-399; Penin, *supra* note , at 645 n.5.

⁶⁰ See Penin, *supra* note , at 645-646; Shavell & van Ypersele, *supra* note , at 530.

observe the social value of innovations and commit to adequate prize payouts on the basis of that information, prizes are superior to intellectual property.⁶¹

b. Resurging interest in the prize system.—The prize system is not a new idea, but economists paid little attention to it throughout most of the 20th century. Intellectual property became the norm, and it is now a rarity to see prizes offered as a replacement for either patents or copyrights. Interest in the prize system surged over the past 15 years, however, and scholars are now engaged in heated debates about whether to eliminate patents on prescription drugs and copyrights on music and books in favor of prizes.

The idea of replacing intellectual property rights with prizes is said to be nearly as old as the intellectual property system itself.⁶² James Madison actually proposed a prize system during

⁶¹ See Chari et al., *supra* note , at 2 (“Any theory of patents as a form of intellectual property must ask why mechanisms cannot be devised which exploit information that will become available in the marketplace after the good has been innovated.”); Gallini & Scotchmer, *supra* note , at 62 (concluding that when “value is observable ex post[,] ... IP should not be used at all, since prizes ... can serve the same screening function, and can motivate firms to the same levels of effort, but prizes avoid the deadweight loss”); Hollis, *supra* note , at 3-4; Peter S. Menell & Suzanne Scotchmer, *Intellectual Property*, in 2 HANDBOOK OF LAW & ECONOMICS _ (2008) (“A unifying theme [in the prize literature] is that, if a prize giver can base the prize on the value of the innovation, then he should do so, and prizes may dominate intellectual property rights.”); NORDHAUS, *supra* note , at 89 (“[A] properly tailored subsidy [i.e., prize] can lower the welfare costs of the patent system.”); STIGLER, *supra* note , at 124 (“If a viable system of lump-sum grants equal to the contribution of a piece of knowledge to the national income (or welfare) could be devised, there would be a good case for using that system rather than patents.”); Wright, *supra* note , at 692 (explaining that if the “informational imbalance is resolved,” then “any rationale presented here for choosing patents over other incentives with lower excess burden collapses”).

⁶² See FRITZ MACHLUP, SUBCOMM. ON PATENTS, TRADEMARKS & COPYRIGHTS OF THE S. COMM. ON THE JUDICIARY, 85TH CONG., AN ECONOMIC REVIEW OF THE PATENT SYSTEM 15 (Comm. Print 1958) (“Proposals for systems of prizes and bonuses to inventors, as alternatives to patents, are almost as old as the patent system.”). Peter Eckersley, *Virtual Markets for Virtual Goods: The Mirror Image of Digital Copyright?*, 18 HARV. J.L. & TECH. 85, 95-96 (2004) (citing various champions of proposals to replace patents with prizes, dating as far back as 1660); CHRISTINE MACLEOD, INVENTING THE INDUSTRIAL REVOLUTION: THE ENGLISH PATENT SYSTEM, 1660-1800 182-200 (1988). In a letter to Thomas Jefferson dated October 17, 1778, James Madison wrote:

With regard to monopolies they are justly classed among the greatest nuisances in Government. But is it clear that as encouragements to literary works and ingenious discoveries, they are not too valuable to be wholly renounced? Would it not suffice to reserve in all cases a right to the Public to abolish the privilege at a price to be specified in the grant of it?

the Constitutional Convention,⁶³ although it appears that it was never discussed,⁶⁴ and the delegates clearly opted for the intellectual property clause now found in the Constitution.⁶⁵ In Europe in the mid-eighteenth century, at a time when many governments were considering abolishing the patent system altogether, prizes were a frequently discussed alternative to the patent system.⁶⁶ The anti-patent movement attracted less attention in the United States at that time, although in 1886 a congressman actually introduced a bill in the U.S. House of Representatives to repeal the patent laws and establish a system of rewards for inventors.⁶⁷

James Madison, Letter to Thomas Jefferson, Oct. 17, 1788, available at http://www.constitution.org/jm/17881017_tj.htm.

⁶³ See Machlup, *supra* note , at 15-16.

⁶⁴ See MAX FARRAND, ED., THE RECORDS OF THE FEDERAL CONVENTION OF 1787, vol. II, 325 (1911) (quoting Madison's proposal as to grant Congress the power "To encourage by premiums & provisions, the advancement of useful knowledge and discoveries.")

⁶⁵ See U.S. CONSTITUTION, Art. 1, sec. 8, cl. 8 ("The Congress shall have Power ... To promote the Progress of Sciences and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.").

⁶⁶ See Mark D. Janis, *Patent Abolitionism*, 17 BERKELEY TECH. L.J. 899, 939-941 (2002) (comparing modern proposals for a prize system with a proposal by Robert Andrew Macfie in 1864); Fritz Machlup & Edith Penrose, *The Patent Controversy in the Nineteenth Century*, 10 J. ECON. HIST. 1, 19 (1950) ("The alternatives most frequently recommended in lieu of patents were bonuses granted to inventors (a) by the government, (b) by professional associations financed through voluntary contributions by private industries, (c) by an intergovernmental agency, or (d) by an international association maintained through contributions from industries of all countries. Proposals along these lines were discussed in the professional journals and conferences almost everywhere."); Steven Shavell & Tanguy Van Ypersele, *Rewards Versus Intellectual Property Rights*, 44 J.L. & ECON. 525, 526 (2001) (citing CHRISTINE MACLEOD, *INVENTING THE INDUSTRIAL REVOLUTION* 191-196 (1988)).

⁶⁷ See Knowledge Ecology International, *Selected Innovation Prizes and Reward Programs* (2008) at 46, at http://www.keionline.org/misc-docs/research_notes/kei_rn_2008_1.pdf.

Defenders of intellectual property ultimately won out over the system's critics.⁶⁸ Enthusiasm for the prize system dwindled in the later part of the 1800s.⁶⁹ By the turn of the century, economists showed little interest in the idea of replacing intellectual property with a prize system.⁷⁰ With a few notable exceptions, the economic literature was devoid of any serious analysis of the prize system for most of the 20th century.⁷¹

In practice, governments now rarely use prizes as an alternative to intellectual property,⁷² leading some scholars to label prizes the “neglected innovation incentive.”⁷³ Although governments and private organizations frequently offer prizes to promote certain types of innovation, the vast majority of these prizes are not conditioned upon innovators giving up their intellectual property rights.⁷⁴ They simply supplement the existing intellectual property system. It is relatively rare for prizes to be offered as an alternative to intellectual property protection.⁷⁵

⁶⁸ Machlup & Penrose, *supra* note , at 19-20 (noting that although proposals to give inventors prizes instead of patents “were discussed in the professional journals and conferences almost everywhere” in the mid- and late 1800s, they “did not receive great support”); Janis, *supra* note , at 939-941.

⁶⁹ See Shavell & van Ypersele, *supra* note , at 527.

⁷⁰ *Id.*

⁷¹ *Id.*

⁷² Cf. Kremer, *supra* note , at 1144-1146 (discussing two examples of patent buy-outs in the early nineteenth century).

⁷³ Jüri Saar, *Prizes: The Neglected Innovation Incentive* (2006), at http://innovationprizecentral.com/pdfs/prizes_the_neglected_innovation_incentive.pdf; see also Shavell & van Ypersele, *supra* note , at 527.

⁷⁴ See Knowledge Ecology International, *Selected Innovation Prizes and Reward Programs* (2008), at http://www.keionline.org/misc-docs/research_notes/kei_rn_2008_1.pdf.

⁷⁵ There are a few examples of prize offerings that required that the invention be placed in the public domain. In 1802, South Carolina purchased Eli Whitney's patent rights on the cotton gin within the state for \$50,000, although Whitney experienced some trouble collecting the prize. See Kremer, *supra* note , at 1145. In 1855, the Steam-Coal Collieries' Association at Newcastle offered a \$500 pound reward for a “method for preventing the emission of smoke from the chimneys of multitubular boilers,” with payment conditional upon the absence of patent rights or certain restrictions on those rights. See Knowledge

Recently, the idea of replacing intellectual property with prizes is attracting attention again. The past fifteen years have seen a virtual explosion of scholarship about prize systems,⁷⁶ particularly in economics⁷⁷ and law,⁷⁸ but also in political philosophy⁷⁹ and medicine.⁸⁰ Some of

Ecology International, *supra*, at 18. In 1859, the British Horological Institute offered a reward for the invention of a watch that was “the best English-made going-barrel movement that can be made in fair trade at a moderate price” with “no patent [or] exclusive right” help upon it. *Id.* at 45. In 1931, the Soviet Union created an Authorship Certificate program wherein inventors could receive prizes in lieu of a patent, and it maintained that program until 2001. *Id.* at 47-48. In 1939, France awarded the inventor of photography an annual pension of 10,000 francs in exchange for his patent rights, which the government then devoted to the public domain (except in England). *See* Kremer, *supra* note , at 1144. In 1946, the United States abolished patents on inventions related to the use of atomic energy for military purposes, and established the U.S. Patent Compensation Board, which had authority to offer rewards for those inventions. *See* Knowledge Ecology International, *supra*, at 19. In 2007, an unnamed entity posted a \$20,000 prize on InnoCentive.com, a registry for scientific innovation prizes, for the invention of a dry-based biolatrane along with “no patents or patent applications preventing the use of the solution.” *Id.* at 27-28.

⁷⁶ Compare Shavell & van Ypersele, *supra* note , at 528 (noting that in the “[m]odern economic literature” as of 2001, “the possibility of rewards is paid relatively little attention”) with Knowledge Ecology International, *Scholarly and Technical Articles and Books on Innovation Prizes*, at <http://www.keionline.org/content/view/82/1> (listing more than 50 articles and books about prizes published after 2001).

⁷⁷ The idea of prizes is not new to economics. *See* Michael Polanyi, *Patent Reform*, 11 REV. ECON. STUD. 61, _ (1943) (arguing, in an article published in 1943, that the patent system should be replaced with a prize regime). The number of economists writing in the area has grown dramatically over the past fifteen years, however. *See* Liam Brunt, Josh Lerner & Tom Nicholas, *Inducement Prizes and Innovation*, CEPR Discussion Paper No. 6917 (2008); V. V. Chari et al., *Prizes and Patents: Using Market Signals to Provide Incentives for Innovations*, Working Paper (Oct. 2009), available at __; Lee Davis and Jerome Davis, *How Effective Are Prizes as Incentives to Innovation? Evidence from Three 20th Century Contests*, in CONTEMPORARY MANAGEMENT OF INNOVATION: ARE WE ASKING THE RIGHT QUESTIONS 230 (Jerome Davis et al., eds. 2006); JA DiMasi & HG Grabowski, *Should the Patent System for New Medicines be Abolished?*, 82 CLINICAL PHARMACOLOGY & THERAPEUTICS 488 (2007); Gallini & Scotchmer, *supra* note ; Earl L. Grinols & James W. Henderson, *Replace Pharmaceutical Patents Now*, 25 PHARMACOECONOMICS 355 (2007); Robert C. Guell & Marvin Fischbaum, *Toward Allocative Efficiency in the Prescription Drug Industry*, 73 MILBANK Q. 213 (1995); Aidan Hollis, *An Efficient Reward System for Pharmaceutical Innovation*, Jan. 1, 2005, at __; Hugo Hopenhayn et al., *Rewarding Sequential Innovators: Prizes, Patents and Buyouts* (2005), at __; Kremer, *supra* note ; William A. Masters, *Research Prizes: A Mechanism to Reward Agricultural Innovation in Low-Income Regions*, 6 AGBIOFORUM 71 (2003); Penin, *supra* note ; Romer, *supra* note ; SUZANNE SCOTCHMER, INNOVATION AND INCENTIVES 32-59 (2006); Shavell & van Ypersele, *supra* note ; SHAVELL, *supra* note , at ; Stiglitz, *supra* note ; Burton A. Weisbrod, *Solving the Drug Dilemma*, WASH. POST., Aug. 22, 2003.

⁷⁸ *See* Michael Abramowicz, *Copyrighted Works as Public Goods*, 1 IPCENTRAL REV. 2004, at http://www.ipcentral.info/review/v1n2abramowicz.html#_edn9; Michael Abramowicz, *Perfecting Patent Prizes*, 56 VANDERBILT L. REV. 115 (2003); Jordan Barry, *When Second Comes First: Correcting Patent's Poor*

this literature is more theoretical in nature, but much of it concerns specific prizes proposals for certain types of innovations. In particular, scholars have been debating whether to eliminate the copyrights on music, movies and books in favor of prizes,⁸¹ and whether prizes should replace drug patents to fund pharmaceutical innovation.⁸²

Secondary Incentives Through an Optional Patent Purchase System, 2007 WIS. L. REV. 585 (2007); Steve P. Calandrillo, *An Economic Analysis of Intellectual Property Rights: Justifications and Problems of Exclusive Rights, Incentives to Generate Information, and the Alternative of a Government-Run Reward System*, 9 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 301 (1998); John F. Duffy, *The Marginal Cost Controversy in Intellectual Property*, 71 U. CHI. L. REV. 37 (2004); FISHER, *supra* note , at ; William Fisher, *Intellectual Property and Innovation: Theoretical, Empirical, and Historical Perspectives* (2001); Peter Eckersley, *Virtual Markets for Virtual Goods: The Mirror Image of Digital Copyright?*, 18 HARV. J.L. & TECH. 85, 106-111 (2004); FISHER, *supra* note ; Mark D. Janis, *Patent Abolitionism*, 17 BERKELEY TECH. L.J. 899 (200); Amy Kapczynski, *Commentary: Innovation Policy for a New Era*, 37 J.L. MED. & ETHICS 264 (2009); F. Scott Kieff, *Coordination, Property, and Intellectual Property: An Unconventional Approach to Anticompetitive Effects and Downstream Access*, 56 EMORY L.J. 327, 403-404 (2006); F. Scott Kieff, *Property Rights and Proprietary Rules for Commercializing Inventions*, 85 MINN. L. REV. 697 (2001); Marhi Kim & Bryan Schwartz, *Economic Prizes: A New Model for Pharmaceutical Innovation*, 6 ASPER REV. INT'L BUS. & TRADE L. 1 (2006); Douglas Gary Lichtman, *Pricing Prozac: Why the Government Should Subsidize the Purchase of Patented Pharmaceuticals*, 11 HARV. J.L. & TECH. 123 (1997); Jessica Litman, *Sharing and Stealing*, 27 HASTINGS COMM. & ENT. L.J. 1, 41-45 (2004); James Love & Tim Hubbard, *The Big Idea: Prizes to Stimulate R&D for New Medicines*, 82 CHICAGO-KENT L. REV. 1519 (2007); Gregory N. Mandel, *Promoting Environmental Innovation with Intellectual Property Innovation: A New Basis for Patent Rewards*, 24 TEMP. J. SCI. TECH. & ENVTL. L. 51, 64-69 (2005); Kevin Outterson, *Patent Buy-Outs for Global Disease Innovations for Low- and Middle-Income Countries*, 32 AM. J.L. & MED. 159 (2006); Arti K. Rai, *The Ends of Intellectual Property: Health as a Case Study*, 70 SPG LAW & CONTEMP. PROBS. 125, 128-130 (2007); Talha Syed, *Should a Prize System for Pharmaceuticals Require Patent Protection for Eligibility?*, IGH Discussion Paper No. 2, June 10, 2009, at http://www.yale.edu/macmillan/igh/files/DP2_Syed.pdf; Peter K. Yu, *P2P and the Future of Private Copying*, 76 U. COLO. L. REV. 653 (2005).

⁷⁹ See Thomas Pogge, *Medicines for the World: Boosting Innovation Without Obstructing Free Access*, in HEALTH RIGHTS (Thomas Pogge & Michael J. Selgelid eds. 2010); Michael J. Selgelid, *A Full-Pull Program for the Provision of Pharmaceuticals: Practical Issues*, 1 PUBLIC HEALTH ETHICS 134 (2008).

⁸⁰ See, e.g., Alan Lyles, *Creating Alternative Incentives for Pharmaceutical Innovation*, 28 CLINICAL THERAPEUTICS 126 (2006); Carl Nathan, *Aligning Pharmaceutical Innovation with Medical Need*, 13 NATURE MEDICINE 304 (2007).

⁸¹ See Abramowicz, *supra* note ; Eckersley, *supra* note ; FISHER, *supra* note ; Litman, *supra* note ; Romer, *supra* note ; Yu, *supra* note ; cf. Raymond Shih Ray Ku, *The Creative Destruction of Copyright: Napster and the New Economics of Digital Technology*, 69 U. CHI. L. REV. 263, 312-315 (2002) (proposing “[s]tatutory levies ... on subscriptions for Internet service and the sales of computer, audio, and video equipment” to “provide a source of revenue for musicians and songwriters instead of copyright”); Glynn S. Lunney, Jr., *The Death of Copyright: Digital Technology, Private Copying, and the Digital Millennium Copyright Act*, 87 VA. L. REV. 813, 852-853, 911-912 (2001) (offering a qualified endorsement of plans “to authorize private copying while attempting to compensate copyright owners by collecting levies on sales of the equipment and blank storage media that enable such copying”); Neil Weinstock Netanel, *Impose a Noncommercial Use Levy To Allow*

In 2007, Senator Bernard Sanders introduced a bill into Congress that would institute a prize system for pharmaceuticals.⁸³ John Edwards repeatedly discussed the idea of replacing drug patents with prizes during his recent presidential campaign,⁸⁴ and promised to convene an expert panel on the issue if elected.⁸⁵ Even the popular press has started running articles about promoting pharmaceutical innovation with prizes instead of patents.⁸⁶

II. EFFICIENT REWARDS FOR INNOVATION

Opposition to the prize system usually stems from one basic objection: the government is apt to blotch prize payouts and undermine the incentives for innovation.⁸⁷ It is possible that the

Free Peer-To-Peer File Sharing, 17 HARV. J.L. & TECH. 1, 35 (2003) (proposing a “noncommercial use levy” for “allowing unhindered P2P file swapping while compensating copyright holders with proceeds of some sort of compulsory license or levy.”); Mark A. Lemley & R. Anthony Reese, *Reducing Digital Copyright Infringement Without Restricting Innovation*, 56 STAN. L. REV. 1345, 1406-1410 (2004) (discussing some of the pros and cons of a “levy” system for financing innovation).

⁸² See Dean Baker, *Financing Drug Research: What Are the Issues?* (2004) at www.cepr.net; Barry, *supra* note , at 638-640; Grinols & Henderson, *supra* note ; Guell & Fischbaum, *supra* note ; AIDAN HOLLIS & THOMAS POGGE, THE HEALTH IMPACT FUND: MAKING NEW MEDICINES ACCESSIBLE FOR ALL (2008); Kapczynski, *supra* note ; Kim & Schwartz, *supra* note ; Kremer, *supra* note , at 1162-1165; Lichtman, *supra* note ; James Love & Tim Hubbard, *Prizes for Innovations in New Medicines and Vaccines*, 18 ANNALS HEALTH L. 155 (2009); Outtersson, *supra* note ; Rai, *supra* note ; Stiglitz, *supra* note ; Syed, *supra* note .

⁸³ Medical Innovation Prize Act of 2007, S.2210, 110th Cong., Oct. 19, 2007.

⁸⁴ See Sarah Rubenstein, *Edwards Pushes Prizes Over Patents for Drugs*, WSJ HEALTH BLOG, Nov. 14, 2007, at <http://blogs.wsj.com/health/2007/11/14/edwards-pushes-prizes-over-patents-for-drugs/>.

⁸⁵ Press Release, *Edwards Details Cost-Savings Measures In Universal Health Care Plan*, June 14, 2007, at <http://www.johnedwards.com/news/headlines/20070614-health-care-costs>.

⁸⁶ See Catherine Rampell, *Invent a Drug, Win \$1 Million*, SLATE, Jan. 23, 2008; John Simons, *A Radical Plan to Lower Drug Costs*, CNNMoney.com, Nov. 30, 2007, at http://money.cnn.com/2007/11/28/magazines/fortune/simons_patent.fortune/index.htm; Scott Woolley, *Prizes Not Patents*, FORBES, Apr. 18, 2006.

⁸⁷ See Croskery, *supra* note , at 639; H.I. DUTTON, THE PATENT SYSTEM AND INVENTIVE ACTIVITY DURING THE INDUSTRIAL REVOLUTION, 1750-1852, 26 (1984) (“Patents at least let the market decide. ‘Honours, rewards and medals’, as Charles Babbage scathingly noted, were nothing more than the ‘feeble expression of the sentiments of mankind’.”); Fritz Machlup & Edith Penrose, *The Patent Controversy in the*

benefits of reducing deadweight loss would more than offset this harm,⁸⁸ but considering the importance of innovation for economic growth,⁸⁹ scholars are understandably nervous about the tradeoff. As a result, the dominant view among economists seems to be that prizes are preferable to intellectual property *if* the government can observe enough about the social value of innovations to offer adequate prize payouts.⁹⁰ Recent scholarship on the prize systems focuses almost exclusively on the question of how the government could establish appropriate rewards.⁹¹

A. ESTIMATING THE SOCIAL VALUE OF INNOVATIONS TO DETERMINE THEIR PRIZE

The case for the prize system depends in large part on whether the government has sufficient information about the social value of innovations to set their reward. In the absence of intellectual property, the government will always have limited information about consumer

Nineteenth Century, 10 J. ECON. HIST. 1, 20 (1950) (explaining that during the patent-abolition debates in the mid- and late-1800s, “[t]he chief objection” to prize proposals “was that their administration would give rise to partiality, arbitrariness, or even corruption—the dangers of all institutions giving discretionary power to administrators.”); JOHN STUART MILL, *PRINCIPLES OF POLITICAL ECONOMY: WITH SOME OF THEIR APPLICATIONS TO SOCIAL PHILOSOPHY* 933 (W.J. Ashley ed., 1909) (“[I]n general an exclusive privilege, one of temporary duration, is preferable [to prizes]; because it leaves nothing to any one’s discretion; because the reward conferred by it depends entirely upon the invention’s being found useful, and the greater the usefulness the greater the reward; and because it is paid by the very persons to whom the service is rendered, the consumers of the commodity.”); See F.M. SCHERER, *INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE* 398 (1970) (“[E]stimating the value of inventive contributions is a difficult task, and any bureaucratic council entrusted with the job is bound to make mistakes and perpetrate inequities. When inequity is inevitable, one might prefer that it be the result of an impersonal income distribution mechanism.”). TIROLE, *supra* note , at 401.

⁸⁸ Cf. JAMES BESSEN & MICHAEL J. MEURER, *PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATION AT RISK* (2009) (arguing that in many industries, patents often reduce the incentives for innovation).

⁸⁹ See *supra* text accompanying notes 1-9.

⁹⁰ See *supra* note 61.

⁹¹ See Abramowicz, *supra* note , at 128-158 (analyzing several prize proposals); Barry, *supra* note , at 630-635 (discussing various proposals for the valuation of patents); Love & Hubbard, *supra* note , at 1528-1534 (discussing many of the prize proposals for pharmaceuticals).

demand. Many economists assumed that this was a fatal flaw in the prize system,⁹² but more recently, scholars demonstrated that the government does not need perfect information about consumer demand to set the appropriate reward.⁹³ The government just needs to do better than the intellectual property system, which sets a fairly low bar. Taking advantage of these flaws, advocates of the prize system have made a respectable case that the government could acquire enough information about innovations to offer prizes that rival or exceed the profits under intellectual property as an incentive for innovation.

Calculating the proper reward for innovations without intellectual property presents a serious challenge. The government needs to base rewards on the social value of innovations, which under most circumstances is impossible to measure objectively. Commercial goods are usually valued by way of the market, where individual consumers reveal their demand for goods through their purchasing decisions. This market-based process for valuing goods only works in the presence of scarcity, and innovations are not scarce goods. They are abstract ideas. Consumers can use them without disclosing information about their willingness to pay. The intellectual property system introduces artificial scarcity into the markets for innovations so that consumers are forced to reveal their preferences. Without intellectual property or some other source of artificial scarcity, the market will offer very little information about the social value of innovations.

⁹² See NORDHAUS, *supra* note , at 82 n.19 (stating that although a policy of “buying inventions at their social value” could “attain the optimum,” “[i]t is unlikely that [this] ideal solution[] would be feasible given the difficulties involved in administering [it]”); STIGLER, *supra* note , at 124 (“The difficulties of devising even remotely objective estimates of social value of pieces of knowledge are prodigious ...”).

⁹³ See Kremer, *supra* note , at 1140-1141; Shavell & van Ypersele, *supra* note , at 529-530.

Prize advocates have proposed a variety of different ways to mitigate this problem. First and foremost, the government can link prize payouts to sales volume,⁹⁴ which discloses the number of consumers who are enjoying the good and provides a data point for estimating demand.⁹⁵ The government could then surmise an innovation's social value by combining the sales-volume data with an estimate of the innovation's utility to consumers⁹⁶ – perhaps based on evidence from consumer surveys about the nature and frequency of its use,⁹⁷ declared consumer preferences through voting,⁹⁸ objective evidence of its utility to the average consumer,⁹⁹ or

⁹⁴ See, e.g., Grinols & Henderson, *supra* note , at 356 (proposing a prize system for drugs where prizes are based on “an intertemporal bounty (ongoing payment) that is tied to market sales”); Shavell & van Ypersele, *supra* note , at 541-542 (“[O]ne supposes that the government could obtain significant information about demand. Most obviously, the government can base its rewards on sales data, which should be relatively easy to obtain ...”).

⁹⁵ Relying on sales figures can be more complicated when an innovation is only a small component of the purchased product. See Abramowicz, *Perfecting Patent Prizes*, *supra* note , at 144 (“When inventions cannot be mapped one-to-one onto products, determining the demand for any particular invention may be extraordinarily difficult”).

⁹⁶ See Michael Abramowicz, *Copyrighted Works as Public Goods*, 1 IPCENTRAL REV. 2004, at http://www.ipcentral.info/review/v1n2abramowicz.html#_edn9. (noting that in the context of prizes for music, “[d]ownload counts provide just one of many means of assessing the popularity of different recordings, and while the government should be wary of relying exclusively on any single measurement that might be manipulated by authors or publishers, agencies might be able to develop reasonably accurate assessments by considering a variety of different proxies and measurement techniques.”); SHAVELL, *supra* note , at 162 (“To give rewards that reflect the social value of information, the state might base the reward on the volume of use of the information, such as the sales volume ... , and on some measure of its utility as well.”). But see FISHER, *supra* note , at 234 (proposing that prize payouts for music and movies be based only on utilization rates, not other measurements of the elasticity of consumer demand, because those other measurements are likely to be flawed, require politically controversial decision-making, and will tilt the incentives for innovation toward the tastes of the rich).

⁹⁷ See Eckersely, *supra* note , at 101-102, 143-150 (proposing a prize system for digital information goods where prize-payouts are based on each consumer's valuation as estimated by their download count, the number of times they use the good (which would be monitored with software), and voluntary consumer voting); FISHER, *supra* note , at 224 (proposing a prize system for music and movies where the prizes are based on the frequency with which consumers listen to or watch the work); Shavell & van Ypersele, *supra* note , at 541-542 (“The government could also attempt to measure more about the demand curve than sales at the market price; it could estimate demand elasticities and undertake surveys to determine the character and frequency of use of, for example, computer software, musical recordings, and cinematic and television productions.”).

⁹⁸ Eckersely, *supra* note , at 101-102, 143-150.

observational studies measuring the social value it created.¹⁰⁰ An alternative strategy is to introduce a small amount of artificial scarcity into the market from which to estimate consumer demand – such as through an auction¹⁰¹ or by observing profits in a limited test market.¹⁰² All of these prize systems can be optional, allowing innovators to keep their intellectual property rights if they think the government’s prize offer is too low.¹⁰³

Each of these mechanisms has problems,¹⁰⁴ and even supporters of the prize system acknowledge that the government cannot accurately estimate consumer demand without

⁹⁹ See, e.g., Love & Hubbard, *supra* note , at 1536-1541 (proposing a prize system for drugs where prizes are largely based on a drug’s sales volume and an estimate of its therapeutic value compared to other available treatments).

¹⁰⁰ See HOLLIS & POGGE, *supra* note , at 27-35 (proposing a prize system for drugs based on government assessments of each drug’s health impact on the population, an admittedly complicated task, that would be done by combining sales volume with information about therapeutic value from clinical trials, epidemiological studies, and other relevant sources).

¹⁰¹ See Kremer, *supra* note , at 1146-1148 & 1158-1162 (proposing a prize system wherein the government holds an auction to assess the value of patents where there is some small chance that the high bidder purchases the patent, but in all other cases the government pays the innovator double the third-highest bid in the auction); cf. Chari et al., *supra* note , at 10-15, 22-24.

¹⁰² See Guell & Fischbaum, *supra* note , at 225 (proposing a patent buyout regime for pharmaceuticals through the government’s power of eminent domain, and to assist in assessing the “just compensation” for each patent, allowing “a market appeal” where “[t]he drug could be marketed by the firm in a specific test area” to observe what “the firm’s true monopoly profits [would be] had it kept the patent”). *But see* Abramowicz, *Perfecting Patent Prizes*, *supra* note , at 135 (identifying several potential problems with Guell and Fischbaum’s proposal for limited monopoly pricing in specific test areas, including that “it might be difficult to extrapolate from the results in the test market” due to “different demographics from the nation as a whole” and subsequent changes in consumer demand for the product).

¹⁰³ Shavell & van Ypersele, *supra* note , at 538-539, 544 (showing an optional reward system to be superior to patents if the government can set prizes conservatively); *see also* Barry, *supra* note , at 635-638.

¹⁰⁴ There have been a number of articles criticizing one or more of these prize proposals. See Abramowicz, *supra* note , at 127-211; Baker, *supra* note ; DiMasi & Grabowski, *supra* note ; Duffy, *supra* note ; Kieff, *supra* note , at 705-717. Any effort to measure the utility of innovations will certainly be crude, and sometimes costly to administer. The proposals to estimate consumer demand with auctions or test markets would also be expensive, *see* Kieff, *supra* note , at 404, and, according to some critics, unreliable. *See, e.g.,* Abramowicz, *supra* note , at 127-211; Kieff, *supra* note , at 705-717. It is probably safer to calculate rewards based on sales volume, but this policy might encourage innovators to inflate their sales figures by setting prices below marginal cost. *See infra* text accompanying notes 210-213.

intellectual property. Prize advocates are also quick to point out that the government does not need perfect information about consumer demand to set an appropriate reward.¹⁰⁵ Firms invest in R&D based on their ex ante information about consumer demand for innovations, which is likely to be imperfect. The government's estimates of consumer demand, which occur ex post, only need to be as good as firms' ex ante information.¹⁰⁶ Additionally, because the monopoly profits from an innovation are always less than its social value,¹⁰⁷ the government has room for error when it estimates demand.¹⁰⁸ If the government can set prizes that come closer to the social value of innovations than the profits earned through intellectual property, perhaps by using sales volume and a conservative estimate of demand, the prize system could even enhance the incentives for innovation.¹⁰⁹

Prize advocates also point to several other reasons why the reward for innovation under an intellectual property system is flawed.¹¹⁰ First, the profits from an intellectual property right do not capture many of the externalities of innovation, such as knowledge spillovers that spur additional R&D and innovation,¹¹¹ or an anticommons effect that deters them.¹¹² Second,

¹⁰⁵ See, e.g., Kremer, *supra* note ; Shavell & van Ypersele, *supra* note ; Stiglitz, *supra* note , at 1706-1709.

¹⁰⁶ See Shavell & van Ypersele, *supra* note , at 542.

¹⁰⁷ Unless a monopolist can price discriminate with near perfection, it cannot appropriate the social surplus from consumers who value the good above its monopoly price, and therefore cannot appropriate the full social surplus created by the good.

¹⁰⁸ See Kremer, *supra* note , at 1140-1141; Shavell & van Ypersele, *supra* note , at 529-530.

¹⁰⁹ See Shavell & van Ypersele, *supra* note , .

¹¹⁰ See, e.g., Stiglitz, *supra* note , at 1706-1709.

¹¹¹ See Kremer, *supra* note , at 1141.

¹¹² See Penin, *supra* note , at 652-653; Stiglitz, *supra* note , at 1711.

because a firm's profits under intellectual property are tied to the social value of its innovation rather than the marginal social return of its R&D investments, the reward under intellectual property can be excessive and cause wasteful patent racing and duplicative innovation.¹¹³ Third, intellectual property can offer an inadequate reward for innovations that primarily benefit the poor.¹¹⁴ This issue is thought to be particularly important in the pharmaceutical industry, where firms devote very little of their R&D investments to diseases like malaria and tuberculosis that primarily affect people who cannot afford to pay high drug prices.¹¹⁵

These various defects in the reward for innovation under intellectual property are essential to the case for the prize system, since they give the government room for error as it estimates consumer demand to calculate prize payouts. Even without perfect information, it is

¹¹³ See *supra* notes 24 & 25. Some scholars have suggested that a prize system for drugs could benefit the public by deterring the development of duplicative drug innovations, so-called “me too drugs,” presumably by offering them a much lower reward, or perhaps no reward at all. See, e.g., Kremer, *supra* note , at 1162 (“Patent buyouts could potentially increase incentives for original invention closer to their social value [and] reduce incentives for wasteful ‘me too’ research”); Stiglitz, *supra* note , at 21 (suggesting that an advantage of drug prizes over patents is that “[m]e-too drugs that do no better than existing ones would get a small prize at best”). Without some way to diminish the total size of the common pool, however, shifting profits from follow-on innovators to the first entrant will likely increase wasteful racing. See Hollis, *supra* note , at 12. Moreover, since most “me too” drugs are the result of competing firms pursuing parallel R&D paths, not the deliberate imitation of existing drugs to steal away their market share, the social-welfare implications of shifting profits toward the first entrant are ambiguous. See Joseph A. DiMasi & Cherie Paquette, *The Economics of Follow-On Drug Research and Development*, 22 PHARMACOECONOMICS 1, 9–10, 10 fig.4 (Supp. 2, 2004).

¹¹⁴ See, e.g., HOLLIS & POGGE, *supra* ; Stiglitz, *supra* note , at 1720-1721. This observation can also be framed as a critique of the distributive consequences of intellectual property. See, e.g., FISHER, *supra* note , at 234 (observing that “one of the great advantages of an alternative compensation system [of prizes] as compared to a market system” is that “[i]n the former, unlike the latter, the menu of entertainment products made available to the public would reflect fairly the preferences of all consumers of digital entertainment and would not be tilted toward the tastes of the rich, who are able and willing to pay more for their songs and films”). This distributive critique is not just a call for increased funding of R&D projects that benefit consumers with inadequate purchasing power: it implies that R&D investments should be reallocated from the projects that benefit the consumers with adequate purchasing power to fund those other projects.

¹¹⁵ See, e.g., Ernst R. Berndt et al., *Advance Market Commitments for Vaccines Against Neglected Diseases: Estimating Costs and Effectiveness*, 16 HEALTH ECON. 491 (2007); DiMasi & Grabowski, *supra* note , at 489-490.

possible that the government could set prize payouts that rival or exceed the performance of intellectual property in promoting socially valuable innovation.¹¹⁶ In other words, a well-designed prize system could eliminate the deadweight loss from intellectual property *and* improve the incentives for innovation.

In a recent twist in the debate, some prize advocates now argue – mistakenly – that the flawed reward for innovation under intellectual property is an independent reason to replace intellectual property rights with prizes.¹¹⁷ This move deemphasizes the prize system’s assumed superiority in static efficiency, focusing instead on the potential dynamic benefits of promoting innovation through prizes.¹¹⁸ The problem with this new argument in support of prizes is that the government could correct any flaws in the incentives for innovation without eliminating intellectual property rights. Governments can directly tax or subsidize an innovator’s profits, give supplement prizes,¹¹⁹ impose a sales tax or offer tax credits on the purchase of innovations,¹²⁰ institute price controls, issue vouchers to consumers with low purchasing

¹¹⁶ See Shavell & van Ypersele, *supra* note , at 539.

¹¹⁷ Joseph Stiglitz, for example, writes that “[t]he innovation incentives are strong in the patent system, but they are distorted, whereas the prize system can provide equivalently strong incentives that are less distorted.” Stiglitz, *supra* note , at 1724; *see also* Love & Hubbard, *supra* note , at 160 (“The use of cash prizes to eliminate legal monopolies for products provides a powerful opportunity to address several flaws that plague the current system. In particular, policy makers would have far more freedom to design incentives efficiently.”).

¹¹⁸ See Love & Hubbard, *supra* note , at 160.

¹¹⁹ The United States now offers supplemental prizes to firms that develop drugs for neglected tropical diseases, giving them a transferable “priority review voucher” that entitles its holder to an expedited FDA review of any drug of its choice. See Henry G. Grabowski *et al.*, *Priority Review Vouchers to Encourage Innovation for Neglected Diseases* (2008).

¹²⁰ The various tax credits offered by the United States federal government for the purchase of energy efficient products are an example of such a policy. See http://www.energystar.gov/index.cfm?c=tax_credits.tx_index.

power,¹²¹ or even purchase innovations directly at a price that alters the innovator's profits. Indeed, any change in the reward for innovation brought about through a prize system could be descriptively recast as a tax or subsidy targeted at innovators with intellectual property rights.¹²² It is unclear why eliminating intellectual property rights offers any advantage in the design or implementation of programs to change the reward for innovation. Problems with the current reward through intellectual property make it more likely that a prize system would be better, but are not an independent justification for preferring prizes to intellectual property.

As a result, the classic formulation of the choice between intellectual property and prizes remains unchanged. Prizes are assumed to result in greater static efficiency through the competitive pricing of innovations, but risk government error or mismanagement in setting prize payouts that would likely stifle future innovation.

B. THE DANGER OF GOVERNMENT MISMANAGEMENT OF THE PRIZE SYSTEM

If a prize system is to offer rewards for innovation that preserve the incentives for R&D, there must be government officials to implement the system competently and without bias. In an intellectual property regime, the government can allow consumers to value innovations through the market, thereby reducing its own control over the incentives for innovation. The prize system, on the other hand, gives the government complete control over innovators' profits by using government officials to appraise new innovations and hand out rewards. The incentives for

¹²¹ Prescription-drug insurance through Medicaid is a targeted consumer subsidy that increases the incentive to develop treatments for disabilities – like Schizophrenia – that disproportionately affect people with or cause them to have low purchasing power. To the extent that the government wants to counteract the uneven incentives for innovation caused by unequal distribution of income, targeted consumer subsidies are the most direct approach to the problem, although they may not be feasible in all cases.

¹²² Although there could be logistical or administrative reasons why it is easier to alter industry profits in the absence of intellectual property rights, none have been offered.

innovation could therefore be distorted by the self-interest or incompetence of government officials who control prize payouts. At its core, the prize system is a large public-expenditure program. The government would need to raise tremendous sums money from taxpayers, and then distribute that money to innovators – most of which would be corporations. Government programs of this nature are vulnerable to a predictable set of distortions. Government officials may sometimes just appropriate a firm’s innovation or offer minimal compensation. At the same time, the pressures of pork-barrel politics, industry rent-seeking and bureaucratic red tape will all affect the prize system to one degree or another. If the government’s track record with procurement spending is any guide, these distortions could be significant.

When the government relies on intellectual property alone to set the reward for innovation, it limits its own control over that reward by allowing consumers to determine the value of new inventions. Firms must sell their innovations to consumers to earn a profit, and consumers decide what they are willing to pay. Although the government controls firms’ ability to set prices through its control over their intellectual property rights, once those rights are in place, the profits from innovation depend on consumer demand. For many scholars, this process of valuing innovations through the market instead of through the government is one of the intellectual property system’s primary virtues.¹²³

In contrast, the prize system requires the government to take complete control over the reward for innovation. As with intellectual property, the government must start by defining each

¹²³ See, e.g., H.I. DUTTON, THE PATENT SYSTEM AND INVENTIVE ACTIVITY DURING THE INDUSTRIAL REVOLUTION, 1750-1852, 26 (1984) (“Patents at least let the market decide. ‘Honours, rewards and medals’, as Charles Babbage scathingly noted, were nothing more than the ‘feeble expression of the sentiments of mankind’”); Peter S. Menell & Suzanne Scotchmer, *Intellectual Property Law*, in 2 HANDBOOK OF LAW AND ECONOMICS 1477 (A. Mitchell Polinsky & Steven Shavell, eds. 2007) (“Since the private value of the invention [protected by intellectual property] generally reflects the social value, inventors should be willing to bear higher costs for inventions of higher value. The intellectual property mechanism encourages inventors to weed out their bad ideas.”).

new innovation to know what the public has been given – the equivalent of setting the scope of a patent or copyright. Rather than allowing consumers to determine the value of that innovation, however, a prize regime requires the government to make that decision, appraising each new innovation and then handing out the reward. As a result, the government exercises complete control over innovators' profits.¹²⁴

Since the prize system relies on the government to measure the value of innovations and set rewards, politics could affect prize payouts. The literature on prize proposals mostly focuses on how the government could acquire enough information about inventions to set an appropriate reward,¹²⁵ but a prize system needs more than just information to be effective. It requires government officials who will design and implement the system properly, such that the rewards for innovation are not overly distorted by rent-seeking and political interference. The motives and competence of the government officials that control prize payouts, along with the opportunities for rent-seeking, could all have an important effect on the outcome of the system.¹²⁶

The most pressing concern with the prize system is that government officials will take advantage of their position to grossly underpay innovators,¹²⁷ who may have little choice but to

¹²⁴ If the government were to use other channels in addition to intellectual property to affect innovators' profits (such as taxes and subsidies), it could exercise this same degree of control over the reward for innovation. Under an intellectual-property regime, however, the government has the option of relying on consumers to determine the value of innovations through the market. That choice is not available to the government under a prize system.

¹²⁵ See, e.g., Calandrillo, *supra* note , at 301, 339-340, 348-350; Chari et al., *supra* note ; Eckersley, *supra* note ; HOLLIS & POGGE, *supra* note ; Kremer, *supra* note ; Shavell & van Ypersele, *supra* note.

¹²⁶ See Abramowicz, *Perfecting Patent Prizes*, *supra* note , at 146-147 (observing that even if “economic science provides tools that the government might use to determine appropriate rewards, that does not show that the government in fact will do a good job of using those tools” because “government officials charged with the task might make various errors” or be biased by “their [personal] motivations”).

¹²⁷ See, e.g., DiMasi & Grabowski, *supra* note , at 489 (“The temptation for legislators and administrators to undervalue innovations is especially great for prize awards. Government budgetary pressures combined with the appearance of windfall profits to pharmaceutical firms for medical advances would contribute to

accept an insufficient reward because their innovation already exists and their costs are sunk.¹²⁸ By lowering the payout, legislators could take credit for being fiscally responsible or redirect funds to projects that bring them immediate political gain.¹²⁹ Eventually the public would suffer from the reduced output of socially valuable innovation, but this malfeasance would be largely hidden because it is hard to observe the absence of new innovations compared to what would have been available if rewards were greater.¹³⁰ Political pressure alone seems unlikely to result in adequate payments to innovators. The most promising solution to this problem is to make prizes optional, since innovators will refuse to give up their intellectual property right if the prize is less than what they expect to earn through a monopoly.¹³¹ This strategy does not work, however,

uncertainties about constraints on the size of prize awards.”); SCHERER, *supra* note , at 399 (arguing that “there is an inherent conservative bias in the prizes granted by administrative and quasi-judicial bodies”); Jean Tirole, *Intellectual Property and Health in Developing Countries*, in UNDERSTANDING POVERTY 313 (A. Banerjee et al. eds. 2005) (“The patent system, for all its flaws, has the major benefit that its market-based reward approach is not subject to the two rocks that bureaucratic procedures usually strike: capture and overpayment, and opportunistic expropriation and underpayment.”). Wright, *supra* note , at 703 (“There is an additional moral hazard problem from the viewpoint of researchers, in that the government may understate its ex post evaluation if it wishes to minimize expenditures, and is not greatly concerned with the effects of such action on the reputation of future governments.”).

¹²⁸ See DiMasi & Grabowski, *supra* note , at 489.

¹²⁹ See Arti K. Rai, *The Information Revolution Reaches Pharmaceuticals: Balancing Innovation Incentives, Cost, and Access in the Post-Genomics Era*, 2001 U. ILL. L. REV. 173, 198 (2001) (noting “the possibility that fiscal pressures might lead the government to underestimate the profit figure, thereby deterring future investment in research”).

¹³⁰ Cf. Wright, *supra* note , at 703 (“There is an additional moral hazard problem from the viewpoint of researchers, in that the government may understate its ex post evaluation if it wishes to minimize expenditures, and is not greatly concerned with the effects of such action on the reputation of future governments.”).

¹³¹ See Shavell & van Ypersele, *supra* note , at 544 (“The optional reward system ... has the practical, political advantage that industry should not object to it, as it can only raise firms’ profits. Moreover, the fear that government would act suboptimally, and give unduly conservative rewards, would be less of an issue under an optional reward scheme because innovators can always obtain intellectual property rights. Indeed, just because of innovators’ option, the government’s temptation to pay too little might be checked under an optional reward system.”)

when the government can exercise control over the market for the innovation,¹³² as is generally true for innovations related to health care.¹³³

While the goal of a prize system is to set reward payments based on the social value of innovations, elected officials may be just as interested in where that money is being spent.¹³⁴ Legislators frequently exhibit a strong preference for public expenditures directed to their constituents.¹³⁵ The narrow political interests of elected officials often have a significant affect on agency spending,¹³⁶ including programs involving R&D expenditures.¹³⁷ In several cases, the misallocation of resources due to pork-barrel politics and other narrow political interests was so

¹³² The Soviet Union's prize system was technically optional in nature, but because the government controlled the market and the patentability standards, innovators reportedly had little choice but to accept whatever prize they were offered. See W A Van Caenegem, *Inventions in Russia: From Public Good to Private Property*, 4 AUSTRALIAN INTELL. PROP. J. 232, 233 (1993).

¹³³ See *infra* note 208.

¹³⁴ See McNollgast, *The Political Economy of Law*, in 2 HANDBOOK OF LAW AND ECONOMICS 1687 (A. Mitchell Polinsky and Steven Shavell eds., 2007).

¹³⁵ See Anthony M. Bertelli & Christian R. Grose, *Secretaries of Pork? A New Theory of Distributive Public Policy*, 71 J. POL. 926, 927 n.2 (2009) (citing numerous studies about how elected officials direct government grants to their constituents).

¹³⁶ See Christopher R. Berry & Jacob E. Gersen, *Agency Spending and Political Control of the Bureaucracy*, (forthcoming) (2010); Christopher R. Berry *et al.*, *The President and the Distribution of Federal Spending* 2, at <https://myweb.space.wisc.edu/bcburden/web/bbh2010.pdf> (finding that districts receive more money when they are represented by members of the President's party); Bertelli & Grose, *supra* note __, at 926 (finding that agencies allocate additional money to states with senators with a similar party affiliation to that of the agency); Scott E. Carrell & Janice A. Hauge, *Politics and the Implementation of Public Policy: the Case of the US Military Housing Allowance Program*, 138 PUB. CHOICE 367, 368 (2009) ("It is widely accepted that politics play a role in federal spending.").

¹³⁷ See Joseph E. Stiglitz & Scott J. Wallsten, *Public-Private Technology Partnerships: Promises and Pitfalls*, 43 AM. BEHAV. SCI. 52, 61 (1999). Using more delicate language to make the same point, the Congressional Budget Office reports that one problem with federal R&D expenditures is that "[c]oncerns about geographic fairness in allocating federal funds may motivate some awards for R&D projects." CONGRESSIONAL BUDGET OFFICE, FEDERAL SUPPORT FOR RESEARCH AND DEVELOPMENT 14-15 (2007).

severe that it undermined entire R&D programs.¹³⁸ The intellectual property system, on the other hand, is fairly resistant to this type of political distortion. Elected officials rarely use the patent or copyright laws to single out particular innovators for special treatment.¹³⁹ It is possible that elected officials would show the same degree of restraint with prize payouts.¹⁴⁰ However, since Congress would be responsible for financing the prize system and control its budget, legislators may feel entitled (or even obligated) to exert influence over the allocation of prize money.

Industry rent-seeking could present an even greater threat to a prize system's effectiveness at promoting innovation.¹⁴¹ Handing out monetary prizes to innovators will encourage firms to invest in R&D, but firms will also look for other ways to capture that money. With government officials in charge of appraising their innovations, firms may try to influence those decisions through any number of strategies, including simple persuasion, campaign contributions, developing personal relationships with the decision-makers, and revolving-door hiring.¹⁴² If

¹³⁸ See Linda R. Cohen & Roger G. Noll, *Government Support for Commercial R&D*, in THE TECHNOLOGY PORK BARREL _ (Linda R. Cohen & Roger G. Noll, eds. 1991).

¹³⁹ See JAFFE & LERNER, *supra* note , at 204-205.

¹⁴⁰ See Abramowicz, *Perfecting Patent Prizes*, *supra* note , at 210-211 (arguing that because “it is rare for a company to lobby Congress to enact legislation extending a patent term, ... probably because legislators view the patent system as the exclusive means of obtaining monopoly power in exchange for innovation,” “prize systems similarly might escape the most blatant rent-seeking abuses”).

¹⁴¹ See Marlynn Wei, *Should Prizes Replace Patents? A Critique of the Medical Innovation Prize Act of 2005*, _ B.U.J. SCI. & TECH. L. _ (2007).

¹⁴² See Jeffrey S. Banks et al., *The Politics of Commercial R&D Programs*, in THE TECHNOLOGY PORK BARREL 67-71 (Linda R. Cohen & Roger G. Noll eds., 1991) (describing the various ways in which – and reasons why – agency officials develop personal relationships with industry officials that bias the agency officials' judgments and distort the flow of government resources); Lloyd Hitoshi Mayer, *What Is This “Lobbying” That We Are So Worried About?*, 26 YALE L. & POL'Y REV. 485, 523-524 (2008) (describing some of the ways that interest groups influence legislators, including by “convinc[ing] a legislator ... to shift those preferences to better align with the group's preferences,” “provid[ing] needed campaign financing and reelection support,” and “providing lavish gifts, lucrative honoraria, desirable social connections, comfortable post-government service positions, and even pleasant companionship”); John Lehman,

some firms are more effective than others at inflating their prize payouts, their rent-seeking activities will distort private R&D investments.¹⁴³

The intellectual property system is also vulnerable to rent-seeking,¹⁴⁴ but switching to the prize system would likely exacerbate these problems, and perhaps significantly so. Government officials can affect an innovator's profits through the intellectual property system only by manipulating the scope or duration of its monopoly rights. The prize system would open up a new – and much more direct – avenue through which government officials could control the flow of money to innovators: the process of appraising innovations and handing out rewards. Moving

Wasteful Defense Spending Is a Clear and Present Danger, WALL ST. J., Jul. 18, 2009 (“All too frequently, procurement officers have become de facto out-placement offices for retiring officers seeking employment in the defense industry.”).

¹⁴³ See Kremer, *supra* note , at 1139.

¹⁴⁴ Since Congress writes the intellectual property laws, those rules are subject to the normal distortions of the democratic process. See Jay P. Kesan & Andres A. Gallo, *The Political Economy of the Patent System*, 87 N.C.L. REV. 1342, 1346 (2009) (finding that “diverse economic and political groups with a stake in the functioning of the patent system influence and shape congressional legislation and determine the direction and scope of the proposed reforms”); Jessica D. Litman, *Copyright Legislation and Technological Change*, 68 OR. L. REV. 275, 359 (1989) (arguing that each time Congress revises the copyright laws, it “rel[ies] on current stakeholders to agree on a statutory scheme, [and] they produce a scheme designed to protect themselves against the rest of us”). On the other hand, Congress rarely intervenes in individual patent and copyright disputes. The intellectual property laws consist mostly of generalized rules that apply to large numbers of potential innovators, which makes it difficult for legislators to single out particular firms for special treatment through the intellectual property system. See JAFFE & LERNER, *supra* note , at 204-205 (noting that with intellectual property, “there is always pressure [by firms] for special treatment,” but “[t]his kind of shenanigans would likely be much worse in a world in which it was broadly accepted that differential patents for different technologies were appropriate”); Clarisa Long, *Our Uniform Patent System*, 55 FED. LAW. 44, 47-49 (2008) (expressing concern about proposals to write industry-specific patent laws into the statute). The PTO is responsible for granting patents to inventors (although its decisions are subject to *de novo* review by the courts). The agency “is not free from political influence,” Kesan & Gallo, *supra* at 1333-34, but its role is usually thought of as ministerial, see Jonathan S. Mazur, *Process as Purpose: Costly Screens, Value Asymmetries, and Examination at the Patent Office*, J. LEGAL ANALYSIS (forthcoming), and the PTO is rarely accused of handing out individual favors. In both the patent and copyright systems, the judiciary makes the case-by-case determinations that affect innovators' profits. See AGREEMENT ON TRADE-RELATED ASPECTS OF INTELLECTUAL PROPERTY RIGHTS (TRIPS), Art. 41 ¶¶ 4 & 5 (requiring that all signatory nations allow for enforcement of intellectual property rights through a judicial system). Those decisions, of course, are vulnerable to distortion by special interests. See Einer Elhauge, *Does Interest Group Theory Justify More Intrusive Judicial Review*, 101 YALE L.J. 31 (1991).

to a prize regime would also change the dynamics of industry rent-seeking. Instead of lobbying for rents in an adversarial setting, where the interested parties are present to contest any transfer of wealth, innovators would be lobbying the government for taxpayer dollars. In sum, the prize system creates a more direct channel for industry rent-seeking while also making the system more vulnerable to manipulation by special interests.

Although this invitation to rent-seeking poses a real danger, an equal threat may come from the public's efforts to prevent that rent-seeking.¹⁴⁵ Attempts to restrain discretion in agency spending to prevent fraud, waste and abuse often result in a spiral of bureaucratic controls that can do more harm than good.¹⁴⁶ If the U.S. government's experience with defense contracting and government procurement spending portends the future of a prize system, then the problems of fiscal pork, rent-seeking and overly-burdensome bureaucracies will all plague the system.¹⁴⁷

¹⁴⁵ Cf. Keith Hartley, *The Arms Industry, Procurement and Industrial Policies*, in 2 HANDBOOK OF DEFENSE ECONOMICS 1140, 1166 (Todd Sandler & Keith Hartley eds., 2007) ("Arms procurement involves public interest issues, with taxpayer's representatives concerned about the efficiency and profitability of arms contracts. The result has been the creation of regulatory regimes to monitor arms contracts, contractors and procurement agencies.").

¹⁴⁶ See, e.g., JAMES F. NAGLE, A HISTORY OF GOVERNMENT CONTRACTING 482 (1999) ("The President's Commission on Government Procurement discovered in 1969 that a typical contracting officer in one echelon of DOD had to consult over five linear feet of procurement regulations and instructions to guide a constrict his activities."); *id.* at 506-507 ("A 1992 study ... found that acquisition laws represented the apex of a 'cascading pyramid' of stricter regulations, overly-detailed military specifications, and common procurement practices that typically added 30 percent to 50 percent of the costs of doing business with the Department of Defense."); Steven Kelman, *Remaking Federal Procurement*, 31 PUB. CONT. L.J. 581, 595-596 (2002) (describing how the procurement procedures became mired in red tape and complicated bureaucratic regulations that "slowed the system down enormously, so that buying products or services took far longer than in the private sector and following the rules took up much of the time of contracting officials").

¹⁴⁷ See John Lehman, *Wasteful Defense Spending Is a Clear and Present Danger*, WALL ST. J., Jul. 18, 2009 ("Because of lack of competition early in programs, there has been a serious decline in technological and engineering innovation. And costs have gone up steadily in mature production programs because of the absence of competition. There is also the revolving door problem. ... All too frequently, procurement officers have become de facto out-placement offices for retiring officers seeking employment in the defense industry."); Bradford C. Mank, *Superfund Contractors and Agency Capture*, 2 N.Y.U. ENVTL. L.J. 34, 56-59 (1993) (noting the record of widespread waste and abuse by Superfund contractors selected by the EPA); JAMES F. NAGLE, A HISTORY OF GOVERNMENT CONTRACTING 446 (1999) ("[A]s symbols of modern

The likelihood that the government will mismanage prize payouts is a significant drawback to the prize system. It is possible that the benefits of eliminating intellectual property still outweigh the costs of some government mismanagement under a prize system. Those possible benefits are addressed in the following section.

III. EFFICIENT CONSUMER PRICES FOR INNOVATION

The justification for promoting innovation with prizes instead of intellectual property is, and must be, that prizes will reduce deadweight loss by bringing consumer prices closer to marginal cost.¹⁴⁸ Interesting, the prize literature largely ignores the question of whether eliminating intellectual property would actually result in more efficient pricing. Much of it assumes, often explicitly, that prices will fall to marginal cost under a prize system, thereby eliminating any deadweight loss from monopoly pricing.¹⁴⁹ Despite the recent surge of

contracting, I would not choose a procurement item such as a computer or a sophisticated machine of war. Nor would I choose a \$400 hammer or a \$7,000 coffee pot. These are merely the latest in a long history of embarrassments. Instead, I would choose the sea of statues, regulations, and paperwork inundating the process, providing flotation for an infinite number of lawsuits relied upon as life preservers.”); Lani A. Perlman, *Guarding the Government’s Coffers: The Need for Competition Requirements to Safeguard Federal Government Procurement*, 75 FORDHAM L. REV. 3187, 3232 (2007) (“From the Department’s inception, DHS procurement has been plagued by the very ills that competitive bidding is designed to guard against: waste, fraud, and abuse.”); Jennifer Jo Snider Smith, *Competition and Transparency: What Works for Public Procurement Reform*, 38 PUB. CONT. L.J. 85, 94 (2008) (describing how the increased discretion given to government officials in their procurement orders made it “too easy for agencies to use their ‘preferred companies,’ resulting in less competition, and this increased waste, cost, and fraud. This was confirmed by audits.”); *id.* at 117 (quoting Scott Amey, the general counsel of the Project on Government Oversight, as saying that “[c]urrently, there is widespread evidence of waste, fraud and abuse in federal contracting.”)

¹⁴⁸ See Shavell & van Ypersele, *supra* note , at 530 (“[T]he reward system is superior to patent in that deadweight loss due to monopoly pricing is avoided under rewards.”).

¹⁴⁹ See BAKER, *supra* note , at 17 (“The key feature that all four of these [prize] proposals have in common is that they largely eliminate the gap between price and marginal cost that is created by the current patent system.”); Calandrillo, *supra* note , at 326-328, 336-337 (“Once the award is given, the innovation falls into the public domain such that it can be reproduced without penalty and distributed to all those whose willingness to pay is equal to or exceeds the marginal cost of production.”); Chari et al., *supra* note , at 1 (“Prizes reward innovators while making the fruits of the innovation public. Competitive markets then

scholarship on prizes,¹⁵⁰ there has been no systematic analysis of the prize system's likely effects on consumer prices. This gap in the literature leaves a significant hole in the case for the prize system. Scholars may have overlooked this question because, given normal market conditions, it is perfectly reasonable to assume that eliminating intellectual property will prevent at least some amount of deadweight loss. Yet the benefits of the prize system might be much smaller than currently imagined.

The advantage of the prize system is that it eliminates any deadweight loss *caused* by intellectual property. Any welfare gains under the prize system therefore depend on the amount of deadweight loss that can be attributed to the intellectual property system. Price discrimination can – and does – alleviate the problems associated with monopoly pricing to a certain extent, thereby reducing the value of switching to prizes. Although some deadweight loss is inevitable because price discrimination is never perfect, much of it might persist even in the absence of intellectual property. Numerous barriers to entry would remain in the markets for many innovations, including barriers like trade secrecy, advantages in know-how, regulatory hurdles, and any large fixed production costs. Moreover, the prize system could introduce its own pricing distortions. Prize system would *probably* still reduce overall deadweight loss to some extent, but those improvements may be quite modest in many markets. In light of these limitations to the

produce an efficient number of units of the good or exploit the idea associated with the innovation as efficiently as possibl[e].”); Patricia M. Danzon & Adrian Towse, *Differential Pricing for Pharmaceuticals: Reconciling Access, R&D and Patents*, 3 INT’L J. HEALTH CARE FINANCE & ECON. 183, 185 (2003); Michael Kremer, *Patent Buyouts: A Mechanism for Encouraging Innovation*, 113 Q.J. ECON. 1137, 1148 (1998) (“Deadweight losses due to monopoly pricing would be eliminated if patents were put in the public domain.”); Shavell & van Ypersele, *supra* note , at 529 (stating their assumption of “no deadweight loss from monopoly pricing” in their model of the prize system); Stiglitz, *supra* note , at 1279 (“The power of competitive markets would ensure a wide distribution [of drugs] at the lowest possible price, unlike the current system, which uses monopoly power, with its high prices and limited usage.”).

¹⁵⁰ See *supra* notes __-__.

prize system, it is possible that the government could use other policies to more effectively reduce deadweight loss, such as price controls or subsidies for consumer purchases.

A. DEADWEIGHT LOSS FROM INTELLECTUAL PROPERTY AND THE MITIGATING EFFECTS OF PRICE DISCRIMINATION

While difficult to measure, many intellectual property rights probably cause at least some deadweight loss – and perhaps a great deal of it. Firms can reduce these harms by offering discounts to consumers who otherwise would exit the market due to monopoly pricing. The intellectual property literature recognizes the prevalence of price discrimination, but overlooks some of the most important occurrences of it. Prescription-drug insurance, various patent pools, and online subscription fees all follow a “two-part tariff” pricing model, which can dramatically reduce deadweight loss for some consumers. Since price discrimination is never perfect, some deadweight loss persists. As a result, there is almost always room for a prize system to benefit the public. In markets where beneficial price discrimination is the norm, however, there is less to gain from switching to prizes.

Intellectual property has a significant drawback: it promotes innovation by forcing consumers to pay higher prices. The resulting deadweight loss is considered the intellectual property system’s greatest vice.¹⁵¹ At the same time, intellectual property rights rarely translate into a pure monopoly.¹⁵² Consumers usually have access to imperfect substitute goods, which

¹⁵¹ See, e.g., NORDHAUS, *supra* note , at 86 (“[T]he patent system can never be an optimal system of encouraging technological change for it involves deadweight loss.”); SCHERER, *supra* note , at 382 (explaining that for the benefit of stimulating innovation through patents, “society pays a price: the monopoly power conferred by patent grants”); SCOTCHMER, *supra* note , at 37 (“Deadweight loss is the main defect of intellectual property as an incentive mechanism.”); SHAVELL, *supra* note , at 142.

¹⁵² Based on surveys of industry executives, many patents are reported to be ineffective at preventing competitors from duplicating the covered technology. Wesley M. Cohen et al., *Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not)* _tbl_, NBER Working Paper 7552 (2000).

prevents innovators from pricing like a true monopolist.¹⁵³ To the extent that intellectual property leads to monopolistic competition or oligopolies, however, it still causes prices to rise above marginal cost, and therefore still results in static inefficiency.¹⁵⁴ In industries where the difference between marginal cost and prices under intellectual property are significant, such as software and pharmaceuticals, the deadweight loss caused by intellectual property might be severe.¹⁵⁵

Markets can mitigate this problem if firms are able to offer discounts to consumers who are unwilling to pay the monopoly price.¹⁵⁶ Every consumer who values a good above its marginal cost but below the monopoly price represents a potentially profitable transaction for its producer. If the firm can continue to charge an elevated price to most consumers while offering discounts to ones who are unwilling to pay the fully monopoly price, it can avoid the deadweight loss from monopoly pricing.¹⁵⁷ Price discrimination of this sort, if perfectly implemented, would eliminate the static inefficiency associated with intellectual property.¹⁵⁸

¹⁵³ See Edmund W. Kitch, *Elementary and Persistent Errors in the Economic Analysis of Intellectual Property*, 53 VAND. L. REV. 1727, 1729-1738 (2000); Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989, 996 n.26 (1997).

¹⁵⁴ See LANDES & POSNER, *supra* note , at 375-377; SCHERER, *supra* note , at 390-391.

¹⁵⁵ See Kremer, *supra* note , at 1140; SCHERER, *supra* note , at 390 (describing patented pharmaceuticals as an “extreme” case of where patents confer significant market power); Stiglitz, *supra* note , at 1701.

¹⁵⁶ Fisher, *supra* note , at 14-16; SCOTCHMER, *supra* note __, at 37.

¹⁵⁷ See Lars A. Stole, *Price Discrimination and Competition*, in 3 HANDBOOK OF INDUSTRIAL ORGANIZATION 2221, 2226 (M. Armstrong & R. Porter, eds. 2007).

¹⁵⁸ See F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 MINN. L. REV. 697, 727-732 (2001) (arguing that “[c]oncerns about dead-weight loss do not provide a proper motivation for seeking alternatives to the system” because “[t]he ability to price discriminate gives the patentee incentive to elect *not* to restrict output ...”).

While the standard account of intellectual property in the economic literature recognizes price discrimination as a potential solution to static inefficiency, it also observes that this type of price discrimination is often difficult to implement, and that perfect price discrimination is usually impossible.¹⁵⁹ There are two major hurdles to discriminatory pricing. First, firms need a way to identify consumers who are unwilling to pay the monopoly price so that they can offer them a discount. Since all consumers prefer a lower price, firms cannot identify the ones who need a lower price merely by asking.¹⁶⁰ They can charge different prices based on the quantity or quality of goods purchased, which may help sort consumers according their willingness to pay, or they can offer discounts to consumers based on observable characteristics that are associated with a weaker demand for the product.¹⁶¹ Both strategies can be costly, and they are almost always imperfect sorting devices.¹⁶² Second, firms must be able to stop the consumers who receive discounts from reselling the good to the consumers who are willing to pay the full price.¹⁶³

¹⁵⁹ See, e.g., LANDES & POSNER, *supra* note , at 40 (explaining that although “perfect price discrimination ... would produce the competitive output,” “the information about consumer demands that would be required in order to be able to practice perfect price discrimination is not obtainable at any cost that would make it worthwhile.”); Lichtman, *supra* note , at 133 n.25; see also Rai, *supra* note , at 188 (describing perfect price discrimination in the pharmaceutical industry as “unfeasible” because of “the administrative costs of gathering accurate willingness-to-pay information, and the difficulty of restricting resale among purchasers”); SCOTCHMER, *supra* note , at 37 (“Price discrimination can go a long distance toward redressing the inefficiency of deadweight loss, but it is hard to implement.”).

¹⁶⁰ Fisher, *Differential Pricing of Information*, *supra* note , at 3-4; SCOTCHMER, *supra* note , at 37-38; TIROLE, *supra* note , at 137.

¹⁶¹ See Michael J. Meurer, *Copyright Law and Price Discrimination*, 23 CARDOZO L. REV. 55, 69-75 (2001).

¹⁶² See Peter T. Leeson & Russell S. Sobel, *Costly Price Discrimination*, 99 ECON. LETTERS 206 (2008). Certain pricing schemes, such as second-degree price discrimination involving quality differentiation, can sometimes reduce total social surplus. See Meurer, *supra* note , at 71-80.

¹⁶³ *Supra* note 160.

There are often practical and legal difficulties with barring consumers from reselling intellectual property goods, which can reduce firms' ability to price discriminate.¹⁶⁴

Despite the significant barriers to price discrimination, the practice is fairly common in markets for goods protected by intellectual property.¹⁶⁵ Examples include the student discounts offered by theaters and software distributors,¹⁶⁶ and drug companies giving large price-breaks to low-income consumers without insurance.¹⁶⁷ Although price discrimination rarely eliminates the deadweight loss from intellectual property,¹⁶⁸ and sometimes it can even be harmful,¹⁶⁹ there are numerous instances where price discrimination expands access to goods beyond what would be available with a single monopoly price.¹⁷⁰

One particular type of price discrimination that can reduce deadweight loss from intellectual property, the "two-part tariff," warrants special attention. Under a two-part tariff, consumers pay the monopolist an upfront fee in exchange for the right to purchase units of the good at a specified price. The classic example of a two-part pricing scheme is Disneyland, where

¹⁶⁴ See Fisher, *Differential Pricing of Information*, *supra* note , at 13-20; Meurer, *supra* note , at 83-85.

¹⁶⁵ See Fisher, *Differential Pricing of Information*, *supra* note , at 4-9 (providing various examples of price discrimination in patented and copyrighted goods); Meurer, *supra* note , at 70-75 (offering numerous examples of price discrimination .

¹⁶⁶ See Meurer, *supra* note , at 70.

¹⁶⁷ See <http://www.togetherrxaccess.com> (last visited Jul. 1, 2010).

¹⁶⁸ *Supra* note 159.

¹⁶⁹ See Fisher, *supra* note , at 22 ("[I]t is impossible to say, in the abstract, whether price discrimination increases or decreases aggregate social welfare."). Price discrimination is more likely to be harmful when a firm only discriminates among high-value users. Under these circumstances, as Michael Meurer explains, "[h]igh valuation buyers lose consumer surplus because they face a higher price, and low valuation buyers are unaffected because they continue to face the old uniform monopoly price." Meurer, *supra* note , at 92.

¹⁷⁰ See Fisher, *supra* note , at 2-9.

consumers pay an upfront fee to get into the park, but once inside they have access to the individual rides for free – a price that approximates the marginal cost of taking a ride.¹⁷¹ Disney has a monopoly over each of the rides in Disneyland, but with the two-part tariff, consumers who pay the upfront fee enjoy access to those rides at the efficient level. The entrance fee causes deadweight loss as some consumers are priced out of Disneyland, but the consumers inside the park completely avoid the deadweight loss normally associated with monopoly pricing.

Although the intellectual property literature rarely mentions this form of price discrimination,¹⁷² two-part tariffs are a common pricing strategy with patented and copyrighted goods. Online music services like Napster and Rhapsody charge monthly subscription fees for unlimited, on-demand access to large collections of songs.¹⁷³ Universities pay subscription fees to various online databases so that their faculty and students can enjoy unfettered access to journal articles.¹⁷⁴ Consumers pay an upfront fee to their cable company for unlimited viewing of the television and movie programming in their bundle.¹⁷⁵ Some industry patent pools offer firms free or low-cost access to patented technologies in exchange for an upfront fee.¹⁷⁶

¹⁷¹ See Walter Y. Oi, *A Disneyland Dilemma: Two-Part Tariffs for a Mickey Mouse Monopoly*, 85 Q.J. ECON. 77 (1971).

¹⁷² For an exception, see Duffy, *supra* note , at 45-46 (noting that “monopolists are free to rely on ‘multi-part’ pricing, by which lower charges would be made for incremental units”).

¹⁷³ See www.rhapsody.com; www.napster.com.

¹⁷⁴ See Steven Shavell, *Should Copyright of Academic Works be Abolished?*, at 37 (2009) (forthcoming, Journal of Legal Analysis) (“Today, universities subscribe to a large number of journals and make their content freely available to many in the university community through library and Internet access ...”).

¹⁷⁵ See Stan J. Liebowitz & Stephen E. Margolis, *Bundles of Joy: The Ubiquity and Efficiency of Bundles in New Technology Markets*, 5 J. COMPETITION L. & ECON. 1, 32-35 (2009).

¹⁷⁶ See Liebowitz & Margolis, *supra* note , at 22-24.

The most noteworthy example of two-part tariff pricing for a patented technology is prescription-drug insurance. When consumers buy prescription-drug insurance, they pay an upfront fee (the insurance premium) that enables them to purchase drugs at the price of their co-payment. To the extent that co-payments for drugs resemble marginal cost, and they are often fairly close,¹⁷⁷ consumers with insurance enjoy efficient access to prescription drugs.¹⁷⁸ As a result, the widespread use of prescription-drug insurance in the United States dramatically reduces the deadweight from drug patents.¹⁷⁹

Although their benefits can be significant, two-part tariffs are not a cure for the deadweight loss caused by intellectual property.¹⁸⁰ People who fail to pay the upfront fee are either excluded from the market or, if they can still purchase the goods individually (like people

¹⁷⁷ See Darius Lakdawalla & Neeraj Sood, *Health Insurance as a Two-Part Pricing Contract*, NBER Working Paper No. 12681, at n. (Nov. 2006). Under the modern practice of tiered formularies, however, consumers often face high co-payments for expensive prescription drugs when there are lower-cost alternatives. See Jesse D. Malkin *et al.*, *The Changing Face of Pharmacy Benefit Design*, 23 HEALTH AFFAIRS 194 (2004).

¹⁷⁸ See Michael Crew, *Coinsurance and the Welfare Economics of Medical Care*, 59 AM. ECON. REV. 906, 906 (1969) (“Where monopoly or some restriction of competition exists in the servicing of liability claims, coinsurance may lead to Pareto optimal situation.”); Gaynor Has-Wilson & Vogt (2000); Darius Lakdawalla & Neeraj Sood, *Health Insurance as a Two-Part Pricing Contract*, NBER Working Paper No. 12681, at 1 (Nov. 2006) (“Health insurance resembles a two-part pricing contract, in which a group of consumers pays an upfront fee in exchange for lower prices in the event of illness. ... Marginal cost co-payments allow a firm to extract the maximum possible consumer surplus, because there is no deadweight loss to consumers.”); *cf.* Alan M. Garber, Charles I. Jones & Paul Romer, *Insurance and Incentives for Medical Innovation*, FORUM FOR HEALTH ECON. & POL., vol. 9, issue 2, art. 4 (2006).

¹⁷⁹ See Lakdawalla & Sood, *supra* note , at 2 (arguing that health insurance can eliminate the deadweight loss from patent protection on pharmaceuticals by allowing consumers to purchase drugs at marginal cost); see also William Fisher, *Intellectual Property and Innovation: Theoretical, Empirical, and Historical Perspectives* 12 (2001) (“Public or private health-insurance systems can, of course, offset [the potential deadweight loss from high drug prices] by enabling the cost of patented drugs to be passed along either to all taxpayers ... or to large populations of potential patients.”).

¹⁸⁰ *Cf.* Shavell, *supra* note , at 38 (“Faculty and students [still] do not have ready access to all articles on the Internet and often face costly-in-time hurdles to locate what is in theory freely available.”).

without prescription-drug insurance), they suffer the normal deadweight loss from a single-price monopoly.¹⁸¹

The Disneyland example helps to explain why, under normal market conditions, deadweight loss persists under a two-part tariff. By setting the price of the individual rides at marginal cost, Disney maximizes the value to consumers of entering the park, which allows it to charge an upfront fee that generates higher profit than would be possible if consumers had to anything pay more than marginal cost to take the rides.¹⁸² If consumer demand were homogenous, two-part tariffs would result in a first-best outcome: firms would set their upfront fee at the monopoly price, which (by assumption) everyone would pay, and then sell their goods to consumers at marginal cost.¹⁸³ Consumer demand is almost never homogenous, of course, and with heterogeneity, monopolists will either set the second part of the tariff above marginal cost, or, more commonly, charge an upfront fee that excludes some consumers from the market.¹⁸⁴ When the upfront fee is set at the monopoly price, consumers who pay the fee will enjoy the efficient level of access to the innovation, but others will still be subject to the inefficient single monopoly price or perhaps excluded from the market entirely. In practice, therefore, two-part tariffs can only lessen the inefficiencies of monopoly pricing.

B. EVALUATING THE PRIZE SYSTEM'S POTENTIAL TO OFFER MORE EFFICIENT CONSUMER PRICING

¹⁸¹ See Kaiser Public Opinion, *Economic Problems Facing Families* 3-4 (April 2008) at <http://kff.org/kaiserpolls/upload/7773.pdf>.

¹⁸² See Oi, *supra* note , at 81-88.

¹⁸³ See Oi, *supra* note , at 81-88; Hal R. Varian, *Price Discrimination*, in 1 HANDBOOK OF INDUSTRIAL ORGANIZATION 601-610 (fix) (Richard Schmalensee & Robert Willig, eds. 1989).

¹⁸⁴ See Varian, *supra* note , at ; TIROLE, *supra* note , at 143-146.

Prize advocates argue that abolishing intellectual property will allow for greater price competition in the markets for innovations, resulting in consumer prices that are closer to marginal cost. This is a sensible argument, and it is probably correct. Nonetheless, the magnitude of the welfare gains from eliminating intellectual property may be much smaller than currently believed. Firms often possess trade secrets and know-how related to their innovations that would give them an advantage over competitors even without intellectual property. A variety of markets are also affected by other barriers to entry, such as FDA regulations, that will continue to insulate innovators from significant price competition. Even if the prize system did somehow lead to perfect competition, any large fixed costs of production would still prevent prices from reaching marginal cost. Basing prizes on sales volume creates other problems. Governments may find it expedient to impose user fees on innovations – which reintroduce deadweight loss – to help fund the prize system and reduce its payments to innovators. At the same time, paying innovators based on sales volume may encourage them to set prices below marginal cost to boost their own profits. These concerns all limit the potential welfare gains from using prizes instead of intellectual property to promote innovation.

1. The argument in support of prizes.—The case for eliminating intellectual property in favor of prizes is ultimately about the benefits of price competition. For innovations that can be reproduced as a digital file, eliminating intellectual property would probably produce true marginal-cost pricing because of the low costs of copying. With more tangible goods, the path to marginal-cost pricing is more nebulous, but prizes are still expected to move prices nearer the optimal.

The prize system uses competition to push consumer prices closer to marginal cost. Without an intellectual property right, innovators would be unable to use the courts to stop competitors from copying their ideas. Unless there is some other barrier to imitation,

competitors could enter the market and sell goods to consumers that are either close or perfect substitutes of the innovation. The resulting price competition would make it difficult for innovators to command any premium in the sale of their products. With perfect competition, prices would fall to average production costs,¹⁸⁵ which the literature generally presumes is close or equal to marginal cost.

A prize system for goods that can be reproduced and distributed as digital files – *e.g.*, music, films, books and software – would likely achieve the ideal result of marginal-cost pricing. There are almost no fixed costs or limits on production capacity in the reproduction and dissemination of digital files, and the variable costs are also near zero. Without the intellectual property system (or digital encryption technology), these goods could all be posted on the Internet and downloaded for free.¹⁸⁶ Since the marginal cost of reproducing a digital file is effectively zero, the market would achieve static efficiency.

For most other types of goods, a prize system is unlikely to result in perfect competition or marginal-cost pricing, although some reduction in price should be expected. Perfect competition is rare for reasons that have little to do with the intellectual property system.¹⁸⁷ Indeed, critics of intellectual property are the first to note that eliminating patents and copyrights would not

¹⁸⁵ The term “average production costs” is used here to mean the total fixed and variable costs of manufacturing and distributing a good, excluding the upfront R&D costs. If there are economies to scale in manufacturing or distribution, perfect competition will not result in true marginal-cost pricing, but rather average cost pricing by firms operating at minimum efficient scales of production. The literature on prizes implicitly assumes that average production costs are equal to marginal costs. *See, e.g.*, Kremer, *supra* note , at 1154; Shavell & van Ypersele, *supra* note , at 529 & 545; Stiglitz, *supra* note .

¹⁸⁶ *See* FISHER, *supra* note .

¹⁸⁷ *See* SCHERER, *supra* note , at 384 (explaining that “real-world markets are almost never purely and perfectly competitive,” and that even without intellectual property, innovations might not be sold at marginal cost because of “natural imitation lags, the advantages of competitive product leadership, and the existence of non-patent barriers to the emergence of a competitive market structure”); TIROLE, *supra* note , at .

reduce the profits from innovation to zero.¹⁸⁸ Nonetheless, a prize system should reduce prices even under conditions of monopolistic competition, since the cost of imitation would be lower and firms could introduce products that are closer to being perfect substitutes for others on the market. The result will not be perfect static efficiency because prices will not be set at marginal cost. If the elimination of intellectual property reduces product differentiation, however, prices should at least move closer to the optimum.

2. *Barriers to entry other than intellectual property.*—Any advantage of prizes over intellectual property depends on the introduction of price competition into the market for innovations. When intellectual property is just one of many barriers to entry in a particular market, the prize system may fail to allow substantial price competition, and the efficiency gains in consumer pricing will be modest. As a result, the benefits from switching to a prize system depend on the significance of intellectual property *relative* to the other barriers to entry in the market.

Innovators will often possess trade secrets and advantages in know-how related to the use of their inventions even without intellectual property. Despite the purported “disclosure function” of patents, firms frequently retain important information about their patented inventions as trade secrets and know-how.¹⁸⁹ Karl Jorda, a prominent practitioner and law professor, observes that “[a]s a practical matter, licenses under patents without access to associated or collateral know-how are often not enough for commercial use of the patented technology.”¹⁹⁰ If the disclosure of technical information under the prize system is similar to that

¹⁸⁸ See, e.g., MICHELE BOLDRIN & DAVID K. LEVINE, *AGAINST INTELLECTUAL MONOPOLY* 67-68 (2008).

¹⁸⁹ See Note, *The Disclosure Function of the Patent System (or Lack Thereof)*, 118 HARV. L. REV. 2007, 2024-25 (2005).

¹⁹⁰ Karl F. Jorda, *Intellectual Property Valuation: The Legal Counterpart/Counterpoint*, Law Seminars International Conference on Mining Patent Portfolios, at 4, Sept. 13, 2004. Jorda continues:

under patents, most firms will retain valuable trade secrets and know-how related to their innovations after they receive a prize. As long as firms maintain control over that knowledge, they can use their trade secrets and know-how to set the price of their innovations above marginal cost – although perhaps not to the same extent as when they also had intellectual property rights on them.

The regulatory barriers to entry in certain industries could present an even greater impediment to price competition. Government agencies like the FDA and EPA often prohibit firms from selling product innovations without first satisfying stringent safety standards.¹⁹¹ For manufacturers of vaccines,¹⁹² biologic drugs,¹⁹³ diagnostics and medical devices,¹⁹⁴ the regulatory

Hence, data and know-how are immensely important. In this regard, let me cite the following persuasive comments:

- ‘In many cases, particularly in chemical technology, the know-how is the most important part of a technology transfer agreement.’ (Homer Blair).
- ‘Acquire not just the patents but the rights to the know-how. Access to experts and records, lab notebooks, and reports on pilot-scale operations, including data on markets and potential users of the technology are crucial.’ (Robert Ebish).
- ‘It is common practice in industry to seek and obtain patents on that part of a technology that is amenable to patent protection, while maintaining related technological data and other information in confidence. Some regard a patent as little more than an advertisement for the sale of accompanying know-how.’ (Peter Rosenberg).
- In technology licensing ‘related patent rights generally are mentioned late in the discussion and are perceived to have ‘insignificant’ value relative to the know-how.’ (Michael Ward, Honeywell VP Licensing).
- ‘Trade secrets are a component of almost every technology license...(and) can increase the value of a license up to 3 to 10 times the value of the deal if no trade secrets are involved.’ (Melvin Jager).

Id. at 4-5.

¹⁹¹ See U.S. CONGRESS, OFFICE OF TECHNOLOGY ASSESSMENT, INNOVATION AND COMMERCIALIZATION OF EMERGING TECHNOLOGIES 64-65 (1995).

¹⁹² Eileen Salinsky & Cole Werble, *The Vaccine Industry: Does It Need a Shot in the Arm?*, National Health Policy Forum (2006).

approval process dramatically increases the costs of copying other firms' innovations.¹⁹⁵ As a result, expiring intellectual property rights often have little effect on prices.¹⁹⁶ In other related industries, however, including small-molecule drugs,¹⁹⁷ agrochemicals¹⁹⁸ and food additives,¹⁹⁹ patent expiration can have a dramatic effect on price because competitors are exempt from much of the regulatory approval process.²⁰⁰

3. *The fixed costs of production and economies of scale.*—Anytime there are fixed costs and economies to scale in producing an innovation, the prize system cannot bring about marginal-cost pricing. The best-case scenario for prizes is a perfectly competitive market. Competitors will

¹⁹³ Patient Protection and Affordable Care Act, H.R. 3590, sec. 7001-7003

¹⁹⁴ 21 U.S.C. § 360e

¹⁹⁵ The regulatory approval process for genetically-modified seeds might have this same effect, depending on whether firms like Monsanto could prevent farmers from “saving seeds” under a prize system through contracting. See Keith T. Atherton, *Safety Assessment of Genetically Modified Crops*, 181 TOXICOLOGY 421 (2002); Business and Industry Advisory Committee to the OECD, *Transparency and the Protection of Regulatory Data*, OECD Joint Meeting, June 2009.

¹⁹⁶ See Rachel Glennerster & Michael Kremer, *A Better Way to Spur Medical Research and Development*, 23 REGULATION 34, 38 (2000) (“A patent buyout would allow firms to compete freely to manufacture a vaccine, but given the technical complexity of manufacturing vaccines and the arduous process of securing regulatory approval, competition might not be intense even if patents were put in the public domain.”); FEDERAL TRADE COMMISSION, EMERGING HEALTH CARE ISSUES: FOLLOW-ON BIOLOGIC DRUG COMPETITION iii-iv (2009) (concluding that “[t]he substantial costs to obtain FDA approval, plus the substantial fixed costs to develop manufacturing capacity, will likely limit the number of competitors that undertake entry with [follow-on biologic] products” to just “two to three” on average “to compete with a particular pioneer biologic drug”).

¹⁹⁷ See Rebecca S. Eisenberg, *The Role of the FDA in Innovation Policy*, 13 MICH. TELECOMM. & TECH. L. REV. 345, 356-59 (2007).

¹⁹⁸ See CropLife Int’l, *On the Protection of Safety and Efficacy Data for Existing and New Crop Protection Chemicals*, Jan. 15 2008.

¹⁹⁹ See Peter Barton Hutt, *Regulation of Food Additives in the United States*, in FOOD ADDITIVES 213-14 (A. Larry Branen et al., eds. 2d 2002).

²⁰⁰ See, e.g., Benjamin N. Roin, *Unpatentable Drugs and the Standards of Patentability*, 87 TEX. L. REV. 503, 510-511 (2009).

enter and drive down prices,²⁰¹ but only up to the point where they still expect to recover their overall investment. In addition to the variable costs of producing each unit of the good, these firms may have incurred start-up costs when they entered the market (*e.g.*, equipment, facilities, training and business licenses), and there may be other fixed costs during production (*e.g.*, overhead and salaries for non-hourly workers). Since firms must expect a return on these investments, entry will occur until prices fall to the average total costs of the marginal entering firm. Marginal-cost pricing, on the other hand, would reflect only the difference in variable costs with the production of each addition unit of the innovation. Whenever there are fixed costs in production or economies of scale, therefore, the prize system cannot achieve marginal cost pricing.

This observation is more pertinent to some technologies than others. There are no real fixed costs associated with online file sharing of music and books, and so marginal costs and average total production costs are about the same. In contrast, due to the immense fixed costs of producing vaccines and biologic drugs,²⁰² the “generic” price of those drugs under a prize system could be much higher than their marginal cost. The case for the prize system is stronger for

²⁰¹ It is *possible* that eliminating intellectual property would spur innovation in production processes, ultimately lowering the marginal costs of production over time. In a market with limited product differentiation and increased price competition, there might be additional pressure on firms to lower their production costs, perhaps resulting in more innovation that, over time, reduces average production costs. *Cf.* Kenneth Arrow, *Economic Welfare and the Allocation of Resources for Invention*, in THE RATE AND DIRECTION OF ECONOMIC ANALYSIS 609 (Richard R. Nelson ed. 1962). *But see* Edmund Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265 (1977) (arguing that compared to competition, a monopolist that is able to coordinate the development of an invention will invest optimally in that development effort); JOSEPH A. SCHUMPETER, CAPITALISM, SOCIALISM, AND DEMOCRACY 101 (3d ed. 1950) (hypothesizing that if price competition is too intense, firms will have inadequate resources for R&D investments). Lower manufacturing and distribution costs would also increase the social and private returns from product innovations, boosting the incentive for those R&D investments as well. *See* John A. Vernon et al., *Pharmaceutical Manufacturing Efficiency, Drug Prices, and Public Health: Examining the Causal Links*, 41 DRUG INFORMATION J. _ (2007).

²⁰² *See supra* note 196.

small-molecule drugs, but even there, prices will not fall to marginal cost. For most brand-name small-molecule drugs, the cost of goods sold is roughly 20 to 30 percent of their gross sales receipts. Much of these costs are fixed, such as building the manufacturing facilities and having them certified by regulators.²⁰³ Generic manufacturers face similar fixed costs in their production process.²⁰⁴ Assuming perfect competition in the absence of intellectual property, prices should fall to the total average cost of generic manufacturers, not their marginal cost of producing each pill. Given the large fixed costs of manufacturing drugs, the generic price for a drug might be noticeably higher than its marginal cost.

4. *Reinstating deadweight loss through user fees on innovations.*—When the government calculates prize payouts based on sales volume, there is a danger that it try to save money by imposing a sales tax on innovations that reintroduces deadweight loss. Most proposals for prize systems rely on observations of sales volume to calculate prizes.²⁰⁵ Given the close connection between the utilization of an innovation and its social value, it is hard to imagine a comprehensive prize system that does anything else.²⁰⁶ Unfortunately, basing rewards on sales volume gives the

²⁰³ See Pradeep Suresh & Prabir K. Basu, *Improving Pharmaceutical Product Development and Manufacturing: Impact on Cost of Drug Development and Cost of Goods Sold of Pharmaceuticals*, 3 J. PHARMACEUTICAL INNOVATION 175 (2008); Prabir Basu et al., *Analysis of Manufacturing Costs in Pharmaceutical Companies*, 3 J. PHARMACEUTICAL INNOVATION 30 (2008).

²⁰⁴ See Basu et al., *supra* note .

²⁰⁵ See, e.g., Chari et al., *supra* note ; FISHER, *supra* note , at 224; Grinols & Henderson, *supra* note ; HOLLIS & POGGE, *supra* note , at 29-31; Love & Hubbard, *supra* note , at 1532; Shavell & van Ypersele, *supra* note , at 540-542.

²⁰⁶ In theory, the government could set prize payouts based on predicted utilization rates rather than ex post sales figures. Michael Kremer's proposal for patent buyouts is an example, since he would have the government value patents through an auction that elicits information about expected monopoly profits. Kremer, *supra* note , at 1146-1148. However, he also acknowledges that the government might need to use observed sales figures to ensure that it does not overpay for patents. Kremer, *supra* note , at 1159-1160.

government a perverse incentive to suppress utilization as a way to reduce its own liabilities.²⁰⁷ The government could use a variety of different policy levers for this purpose,²⁰⁸ but the most direct is to impose user fees on innovations to inflate their price, thereby suppressing sales volume while also raising money to help finance the prize system.²⁰⁹ From the public's perspective, these user fees are harmful because they undermine some (or all) of the efficiency gains from the prize system. Nevertheless, so long as the government is operating under budget constraints and calculates prizes based on sales volume, it will have a strong incentive to suppress the utilization of innovations through a sales tax or something similar.

5. *The potential for innovators to set prices below marginal cost.*—While the government has an incentive to raise prices above marginal cost under the prize system, innovators will sometimes have an incentive to do the exact opposite. Linking prize payouts to sales volume can, under the right circumstances, make it profitable for firms to sell their innovations at a price below marginal cost (or engage in excessive marketing), since the resulting increase in sales would boost

²⁰⁷ Cf. William P. Rogerson, *Economic Incentives and the Defense Procurement Process*, 8 J. ECON. PERSPECTIVES 65, 81 (1994) (“even if the government could find some way to commit more strongly to treating sunk investment expenses as reimbursable costs when it decides to purchase weapons, such a policy would still exhibit a significant problem. If the regulations worked perfectly, and military services felt completely obligated to negotiate prices which included payments for sunk assets, then the military service must pay these costs if it purchases the weapon, but can avoid them if it does not purchase the weapon. To put it another way, the military services will view sunk costs as variable, leading to inefficient behavior.”).

²⁰⁸ Governments with national health insurance systems use a variety of techniques to control the use of prescription drugs to fit within the system's budgetary constraints, including restrictive formularies, prescribing guidelines, prescribing budgets for physicians or hospitals, and marketing restrictions. See U.S. DEPARTMENT OF COMMERCE, PHARMACEUTICAL PRICE CONTROLS IN OECD COUNTRIES: IMPLICATIONS FOR U.S. CONSUMERS, PRICING, RESEARCH AND DEVELOPMENT, AND INNOVATION 7-9 (2004).

²⁰⁹ Cf. Sarah Thomson & Elias Mossialos, *Influencing Demand for Drugs Through Cost Sharing*, in REGULATING PHARMACEUTICALS IN EUROPE: STRIVING FOR EFFICIENCY, EQUITY AND QUALITY 227-244 (Elias Mossialos et al. eds. 2004) (describing the use of co-payments and other cost-sharing mechanisms in OECD countries to reduce government spending on prescription drugs).

their prize receipts.²¹⁰ If they do, consumption would be excessive, and the asserted superiority of prizes over intellectual property in static efficiency might be called into question. Moreover, these strategies will corrupt the reliability of sales-volume data as a signal of the social value of innovations, making it harder for the government to construct a trustworthy mechanism to set prize payouts.²¹¹

The government's response to this problem could have a significant effect on the benefits of switching to a prize system. One way to prevent innovators from selling their goods at a price below marginal cost is to prohibit them from manufacturing it. This policy, however, might not be practical in industries where R&D and manufacturing investments are intertwined. Additionally, if innovators are forbidden to manufacture their goods, the government will still need to prevent them from secretly paying the manufacturers to lower their prices or from subsidizing consumer purchases. An alternative strategy is for the government to prohibit innovators from pricing below marginal cost, and use the prices set by competitors as the measure of marginal cost. In essence, the government would prohibit innovators from charging a lower price than their competitors. This approach does not work well, however, when innovators have an advantage over their competitors – such as trade secrecy and know-how – that make them the most efficient producers. Also, the government would need to prevent innovators from colluding with one of their competitors to set prices below marginal cost. Nonetheless, this price-regulation strategy is the more promising of the two.

²¹⁰ See HOLLIS & POGGE, *supra* note , at 34; Shavell & van Ypersele, *supra* note , at 540 n.35.

²¹¹ See Peter K. Yu, *P2P and the Future of Private Copying*, 76 U. COLO. L. REV. 653, 708 (2005) (noting that under a prize system for music where prizes are based on download counts, “[f]ans are able to abuse the system by repeatedly downloading songs of their favorite artists or by inflating download counts using ‘ballot-stuffing’ programs or mistaken identities.”).

If the government cannot find a practical way to prevent innovators from pricing below marginal cost, the prize literature notes that the government might need to intervene and try to set prices at marginal cost directly.²¹² Once the government imposes price controls, however, the prize system is no longer utilizing competition to drive prices toward marginal cost. At that point, it is unclear what purpose would be served by eliminating intellectual property rights.²¹³

6. *Conclusion.*—Taking these considerations into account, it is no longer certain that consumer prices under a prize system will be superior to the normal monopoly pricing strategies that intellectual-property holders use. If innovators are practicing an efficient form of price discrimination under the intellectual property system, it is possible that a prize system could make things worse: either by financing the prize payouts with a sales tax that causes more distortion than the monopolists’ pricing schemes, or by encouraging innovators to price goods below marginal cost. The other limitations to marginal-cost pricing under a prize system, including barriers to entry besides intellectual property and the fixed costs of production, simply limit the potential for gains from eliminating intellectual property.

C. ALTERNATIVES TO THE PRIZE SYSTEM: USING PRICE CONTROLS OR SUBSIDIES TO SET CONSUMER PRICES AT MARGINAL COST

²¹² See Shavell & van Ypersele, *supra* note , at 540 n.35 (“The government could prevent such strategic increases in [quantity sold] by forbidding the innovator from selling below the competitive price”); HOLLIS & POGGE, *supra* note , at 16 (proposing that the government set consumer prices to approximate marginal cost because otherwise an innovator “might give the product away in the hopes of increasing its reward”).

²¹³ Aidan Hollis and Thomas Pogge’s “Health Impact Fund” appears to be the only proposal in the prize literature to explicitly call for the government to try to set prices at marginal cost, and not surprisingly, it also dropped the requirement that firms give up their intellectual property rights in exchange the government payment. HOLLIS & POGGE, *supra* note , at 16. In other words, their proposal ceased to be a prize system – at least so far as prizes are defined as an alternative to intellectual property.

In light of the prize system's limitations, it is important to compare prizes with other policy levers that might reduce deadweight loss without eliminating intellectual property. While the prize system relies on price competition to push prices closer to marginal cost, the government could also intervene directly by using price controls or subsidizing consumer purchases. When the government can observe marginal costs, as it can with music and books downloaded from the Internet, it could use these tools to achieve efficient pricing without needing to abolish intellectual property. Observing marginal cost is much harder for innovations that are produced and distributed in physical form, which strengthens the case for prizes. Nonetheless, for products like vaccines and biologic drugs, where eliminating intellectual property will only have a modest effect on prices, price controls or subsidies may be the only way to significantly improve static efficiency. Additionally, the government may prefer price controls or subsidies to prizes as a way to prevent innovators from pricing their goods below marginal cost. Preserving intellectual property could also restrain the government from grossly under-compensating innovators by giving them leverage in their negotiations with government officials over their reward. These considerations may help explain why governments often continue to use the intellectual property system even when they control the reward for innovation.

Replacing intellectual property with prizes is not the only way to move consumer prices closer to marginal cost. Much of the prize literature automatically equates intellectual property with monopoly pricing.²¹⁴ This is a mistake. Intellectual property gives innovators the exclusive right to make, use and sell their creations, which provides them with market power to set prices.

²¹⁴ See *supra* note .

This market power does not provide innovations with a *right* to set prices. The government can always intervene in the market to control the price of innovations.

One alternative to replacing intellectual property with prizes is for the government to use price controls to attempt setting consumer prices directly at marginal cost. Used in combination with reward payments – no different from prize payouts – to compensate innovators for the loss of their monopoly profits, these price controls would provide consumers access to innovations at marginal cost without jeopardizing the incentives for innovation, or at least, no more so than the prize system.²¹⁵ In most developed countries, governments use this approach to provide their citizens with access to prescription drugs. Under auspices of their national health care systems, these governments set consumer prices for drugs at a specified co-payment, and then they pay pharmaceutical companies based on sales volume at a negotiated reimbursement rate.²¹⁶ Their reimbursement systems effectively control the reward for pharmaceutical innovation, and therefore closely resemble many of the scholarly proposals for determining rewards under a prize system.²¹⁷ Nonetheless, these governments have retained their intellectual property system and

²¹⁵ See Fisher, *Intellectual Property and Innovation*, *supra* note , at 12 (noting that “[p]ublic or private health-insurance systems can, of course, offset [the potential deadweight loss from high drug prices] by enabling the cost of patented drugs to be passed along either to all taxpayers (in which case the exercise of intellectual-property rights begins to resemble government rewards for innovative activity) or to large populations of potential patients”).

²¹⁶ See Livio Garattini *et al.*, *Pricing and Reimbursement of In-Patent Drugs in Seven European Countries: A Comparative Analysis*, 82 HEALTH POL. 330 (2007); Brian Godman *et al.*, *Having Your Cake and Eating It: Office of Fair Trading Proposal for Funding New Drugs to Benefit Patients and Innovative Companies*, 26 PHARMACOECONOMICS 91 (2008); David A. Henry *et al.*, *Drug Prices and Value for Money: The Australian Pharmaceutical Benefits Scheme*, 294 JAMA 2630 (2005); Elias Mossialos *et al.*, *Pharmaceutical Pricing in Europe: Weighing Up the Options*, 59 Int’l Soc. Security Rev. 3, 9-10 (2006).

²¹⁷ In the debate about whether to replace drug patents with prizes, several scholars have noted that calculating prize payouts is no different from setting the reimbursement rate under a government-run insurance system. See, e.g., Love & Hubbard, *supra* note , at 1541; Hollis, *supra* note , at 2.

set consumer prices directly through price controls instead of allowing competition to reduce prices.

Another possibility is for the government to subsidize the purchase price of innovations so that consumers' out-of-pocket costs are much closer to marginal costs.²¹⁸ Economists have discussed the possibility of subsidizing public utilities to induce marginal-cost pricing since the 1930s.²¹⁹ Applied to innovation, these proposals would call for the government to pay firms for each sale of their patented or copyrighted product, encouraging them to lower prices as a way to increase sales and collect additional subsidies. If calibrated correctly, those subsidies would induce firms to set prices at marginal cost. Since the subsidies would also drive up the innovators' profits, perhaps producing excessive incentives for innovation, the government might need to levy a lump-sum tax on innovators to offset some of their gains.²²⁰ Alternatively, it could avoid any need for a lump-sum tax if, as Doug Lichtman proposes, the government targets its subsidies at consumer purchases that monopoly pricing would otherwise prevent.²²¹ Consumer

²¹⁸ Doug Lichtman and Jordan Barry have both discussed the possibility of using subsidies instead of a prize system to reduce the deadweight loss caused by intellectual property. See Lichtman, *supra* note (arguing that the government should subsidize the purchase of prescription drugs for consumers who would otherwise be pushed out of the market by monopoly pricing); Barry, *supra* note , at 609-19 (arguing that consumer subsidies are not a viable alternative to a prize system that eliminates intellectual property rights).

²¹⁹ See R.H. Coase, *The Marginal Cost Controversy*, 13 *ECONOMICA* 169, 169-70 (1946); Mark Armstrong & David E.M. Sappington, *Recent Developments in the Theory of Regulation*, 3 *HANDBOOK OF INDUSTRIAL ORGANIZATION* 1562-65 (M. Armstrong & R. Porter, eds. 2007).

²²⁰ See Barry, *supra* note , at 609-14.

²²¹ See Lichtman, *supra* note .

tax credits for energy-efficient technology²²² and government subsidies for prescription-drug insurance²²³ are both examples of using subsidies to reduce the price of innovations.

Assuming that the government can observe the marginal costs of producing an innovation, direct price controls and consumer subsidies will often be superior to the prize system as a means to marginal-cost prices. Under the prize system, there are a variety of market conditions that will prevent prices from falling to marginal cost, including innovators' trade secrets and know-how, regulatory barriers to entry and the fixed costs of production.²²⁴ If the government can observe marginal cost, it could set prices there with either price controls or subsidies. Both strategies would avoid the pricing inefficiencies permitted by prizes. In markets where the prize system would result in perfect marginal-cost pricing, prizes would be equivalent to government price controls or consumer subsidies, but no better.

These conclusions are based on a rather heroic assumption, since it is often very hard to observe marginal costs as a regulator.²²⁵ There are a few places where marginal cost is easy to observe, such as online file sharing of music and books – where marginal cost is essentially zero. Under these limited circumstances, government price controls and subsidies match the efficiency

²²² See, e.g., U.S. Department of Energy, *Consumer Energy Tax Incentives*, at <http://www.energy.gov/taxbreaks.htm> (listing the various tax credits available for energy-efficient technologies under the American Recovery and Reinvestment Act of 2009).

²²³ See DiMasi & Grabowski, *supra* note , at 488 (“The underconsumption produced by patents for this uninsured population, however, can be remedied by taking the much less radical step of insuring the uninsured (at co-payments or co-insurance rates that approximate marginal production costs), rather than replacing patents and their market exclusivities with prize funds”); Rai, *supra* note , at 179 (“[S]ubsidies directed at providing insurance for the uninsured could eliminate deadweight loss by giving all individuals the benefit of this price discrimination. Moreover, as contrasted with buyouts, ... subsidies directed at providing insurance to the uninsured would require a relatively small commitment of tax revenue.”).

²²⁴ See *supra* text accompanying notes 189-204.

²²⁵ See Jonathan B. Baker & Timothy F. Bresnahan, *Empirical Methods of Identifying and Measuring Market Power*, 61 ANTITRUST L.J. 3, 5 (1992).

of prizes, since all three systems would – if implemented properly – result in perfect marginal-cost pricing. Most innovations must be manufactured and distributed in a physical form, which makes it much more difficult to measure marginal costs.²²⁶ The government might try to use expert engineering assessments, solicit quotations from other manufacturers, or perhaps even audit the innovator’s own cost figures.²²⁷ All three approaches would be expensive, and in many cases might be unreliable.

The case for the prize system is stronger when the government cannot reliably measure marginal costs, but it is still not absolute. The prize system sets prices through the market, relying on increased price competition to push prices closer to marginal cost, and markets are usually better than the government at setting prices. The prize system might avoid a variety of pathologies that often afflict government price controls.²²⁸ On the other hand, the market price of some innovations under the prize system will be very different from their marginal costs. Remaining barriers to entry, fixed costs of production, and strategic pricing by innovators may leave a lot of room for improvement. It is possible that even with limited information, the government could set prices closer to marginal cost than the results of increased price competition through eliminating intellectual property. In the market for vaccines and biologic drugs, for example, where the regulatory barriers to entry will block most competition, price controls or subsidies might be the only way to meaningfully improve static efficiency.²²⁹

²²⁶ See Louis Kaplow & Carl Shapiro, *Antitrust*, in 2 HANDBOOK OF LAW AND ECONOMICS 1088 (A. Mitchell Polinsky and Steven Shavell eds. 2007) (“Marginal cost ... may be more difficult to measure, due both to the difficulties in identifying which costs are variable (and over what time period) and to the presence of common costs that may be difficult to allocate appropriately. In part for this reason, the empirical industrial organization literature ... often treats marginal cost as unobservable.”).

²²⁷ See HOLLIS & POGGE, *supra* note , at 16.

²²⁸ See Anne O. Krueger, *Government Failures in Development*, 4 J. ECON. PERSPECTIVES 9 (1990).

²²⁹ See *supra* note and text accompanying note 196.

There might be other reasons to prefer price controls or subsidies to the prize system. If the government cannot prevent innovators from manipulating consumer prices to boost their prize payouts, it may have no choice but to set prices directly.²³⁰ Alternatively, once the government has control over the rewards for innovation, maintaining the intellectual property system might be the best way to prevent it from underpaying firms for their innovations. Although their R&D investments are sunk when they negotiate for their reward, if firms can deny the public access to their innovations, then they still have some leverage over government officials. If other manufacturers can step in to supply the good, innovators must rely entirely on the government's good graces for their compensation.

Finally, when the cost of an innovation is partially covered by government-run insurance, as is often true with drugs, diagnostics and medical devices, the government may prefer price controls over prizes because of the nature of insurance. Although marginal-cost pricing allows for efficient consumer access to innovations, there are reasons why the optimal co-payment under an insurance plan might differ from marginal cost. Consumers could prefer to pay less than marginal cost to offset the loss from an adverse health event, or above marginal cost to discourage unnecessary consumption due to moral hazard. Given the various cross-price elasticities between drugs, diagnostics, medical devices and medical services, optimal co-payments will frequently differ from marginal cost.²³¹ Under these circumstances, where a public insurer controls consumer prices through a co-payment schedule and does not set them at marginal cost, government price controls may be inevitable.

²³⁰ See *supra* text accompanying notes 210-213.

²³¹ See Dana Goldman & Tomas J. Philipson, *Integrated Insurance Design in the Presence of Multiple Medical Technologies*, AM. ECON. REV. 2007.

Although competition is generally superior to government price controls or large-scale subsidies, they may be reasonable alternatives to the prize system under certain circumstances. Scholars should not assume that if the government is setting the reward for innovations, prizes are always preferable to intellectual property.

IV. CONCLUSION

The prize literature mostly ignores the question of how best to set prices at marginal cost. Although prizes will push prices closer to marginal cost in most instances, for many inventions the change might be modest. With respect to pharmaceutical innovation, the focal point for most modern scholarship on prize systems, it is unclear whether the prizes are actually superior to a system of intellectual property combined with price controls and payments to innovators. For goods available that are available for download on the Internet, where the government knows that the marginal cost is zero, the difference between prizes and intellectual property with government price controls would seem to be insignificant.

The existing literature on prizes conflates two distinct questions in its comparison of prizes with intellectual property. The consensus view is that if the government can observe the social value of innovations, it should grant prizes instead of intellectual property because the public would receive the same benefits of innovation without the deadweight loss from higher consumer prices. This view assumes that the only way to achieve marginal-cost pricing is to eliminate intellectual property, which is not always true. Assuming that the government can observe the social value of innovations, it might want to eliminate intellectual property rights, but it might also want to issue those rights along with supplemental prizes and price controls or consumer subsidies. The comparison between the two approaches depends on which is more likely to result in marginal-cost pricing. The existing literature on prizes addresses a different

Draft

Please do not cite without permission from the author.

question: whether (or how) the government could observe enough information about innovations to offer a reward without subjecting the public to monopoly pricing. The answer to that question is important regardless of whether the government can eliminate intellectual property rights – which might be politically infeasible or forbidden under TRIPS.